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CLAIMS

[Claim(s)]
[Claim 1] In the liquid crystal panel with which it came to pinch a liquid crystal layer, and two or more pixels were arranged between the substrates of said pair between the substrates of a pair It is the liquid crystal panel characterized by the thing which consist of the 1st block which it comes to give orientation processing of liquid crystal to the liquid crystal layer side of one [at least] substrate of the substrate of said pair, and consists of two or more pixels of one [said] substrate, and two or more pixels, and which the 2nd block of the orientation processing directions of liquid crystal differs mutually.
[Claim 2] In the liquid crystal panel which comes to prepare the effective viewing area by which came to pinch a liquid crystal layer and two or more pixels were arranged between the substrates of said pair between the substrates of a pair It comes to give orientation processing of liquid crystal to one [at least] substrate of the substrate of said pair. In said effective viewing area The 2nd block of the orientation processing directions of liquid crystal differs mutually. it consists of the 1st block which consists of two or more pixels of one [said] substrate, and two or more pixels -- the 1st and said 2nd block The liquid crystal panel characterized by being constituted so that said the 1st and block [2nd] direction of clear vision which have been arranged at the position of symmetry of the both sides of said symmetry axis may become axial symmetry to said symmetry axis, while being formed so that it may become axial symmetry to the symmetry axis which carries out abbreviation bisection of said effective viewing area.
[Claim 3] It is the liquid crystal panel characterized by being formed by changing partially the orientation processing conditions over the front face which attends said liquid crystal layer of one [said] substrate the 1st and said 2nd block in claim 1 or claim 2.
[Claim 4] In the liquid crystal panel which comes to prepare the effective viewing area by which came to pinch a liquid crystal layer and two or more pixels were arranged between the substrates of said pair between the substrates of a pair It comes to give orientation processing of liquid crystal to one [at least] substrate of the substrate of said pair. While said effective viewing area has four blocks constituted by dividing into axial symmetry to an up-and-down symmetry axis and a symmetry axis on either side, respectively and the directions of clear vision of said four blocks differ mutually The liquid crystal panel characterized by being constituted so that it may become axial symmetry to said symmetry axis.
[Claim 5] In the liquid crystal panel which comes to prepare the effective viewing area by which came to pinch a liquid crystal layer and two or more pixels were arranged between the substrates of said pair between the substrates of a pair While, as for said two or more blocks, the orientation processing directions of liquid crystal differ by coming to give orientation processing of liquid crystal to one [at least] substrate of the substrate of said pair, and said effective viewing area having two or more blocks which consist of two or more pixels The direction of clear vision of a block of said plurality is a liquid crystal panel characterized by not being axial symmetry to the symmetry axis of said effective viewing area.
[Claim 6] In the manufacture approach of a liquid crystal panel of coming to prepare the effective viewing area by which came to pinch a liquid crystal layer and two or more pixels were arranged between the substrates of said pair between the substrates of a pair Orientation processing is performed on the orientation processing conditions predetermined to the 1st block which consist of two or more pixels to the front face which attends said liquid crystal layer of one [at least] substrate of the substrate of said pair. The manufacture approach of the liquid crystal panel characterized by performing orientation processing to the 2nd block which consists of two or more pixels on predetermined orientation processing conditions which are different in the 1st block, sticking the substrate of said pair on after an appropriate time, pouring in liquid crystal between them, and

forming said liquid crystal layer.
[Claim 7] The manufacture approach of the liquid crystal panel characterized by performing orientation processing so that said direction of clear vision (the 1st block and the 2nd block) arranged at the position of symmetry of the both sides of said symmetry axis may become axial symmetry to said symmetry axis, while being formed so that it may become axial symmetry in claim 6 to the symmetry axis with which the 1st and said 2nd block carry out abbreviation bisection of said effective viewing area.
[Claim 8] It is the manufacture approach of the liquid crystal panel which it is made for the orientation processing direction of one [said] substrate to differ from the direction of torsion of said liquid crystal mutually in the 1st block and said 2nd block in claim 6 or claim 7, and is characterized by making the orientation processing direction over the substrate of another side of the substrate of said pair into said the 1st and direction where the 2nd block is the same.
[Claim 9] The manufacture approach of the liquid crystal panel characterized by changing said the 1st and orientation condition of block [2nd] liquid crystal by pouring in common liquid crystal and changing the orientation processing direction over one [said / said] substrate (the 1st block and the 2nd block) into the 1st and said 2nd block in claim 6 or claim 7.
[Claim 10] The manufacture approach of the liquid crystal panel characterized by performing orientation processing by performing a beam exposure to the orientation film formed in claim 6 or claim 7 on the front face which attends said liquid crystal layer of one [said] substrate.
[Claim 11] It is the manufacture approach of the liquid crystal panel characterized by said beam exposure being an ion beam exposure in claim 10.
[Claim 12] The manufacture approach of the liquid crystal panel characterized by controlling said the 1st and orientation processing direction of block [2nd] liquid crystal by irradiating said ion beam aslant on the front face of one [said] substrate, and changing exposure bearing of said ion beam partially in claim 10.
[Claim 13] The manufacture approach of the liquid crystal panel characterized by controlling said the 1st and orientation processing direction of block [2nd] liquid crystal by performing said beam exposure in claim 10 or claim 11 using the mask which covers the front face of said substrate partially.
[Claim 14] The manufacture approach of the liquid crystal panel characterized by performing said the 1st and block [2nd] orientation processing in the direction which formed said pixel arranged in the shape of a matrix, the switching element formed for every pixel, and the data line and the scanning line which cross in order to supply potential to this switching element in claim 6, claim 7, claim 10, or claim 11, and met either this data line and the scanning line.
[Claim 15] It has two or more liquid crystal panels indicated by any 1 term from claim 1 to claim 5. It is constituted so that the synthetic image which comes to compound two or more image components by which light modulation was carried out with each liquid crystal panel may be projected. The projection mold display characterized by being constituted so that it may be compounded, where mirroring is carried out to said symmetry axis extended in the direction in which said image component of at least 1 differs from the direction of clear vision of said liquid crystal panel to said other image components.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to a projection mold display at a liquid crystal panel and its manufacture approach list, and especially, when using for the projection mold display constituted so that two or more image components might be formed using two or more liquid crystal panels, the image component of these plurality might be compounded and it might project as a desired image, for example, a color picture, it relates to the configuration of a suitable liquid crystal panel.
[0002]
[Description of the Prior Art] In the projection mold indicating equipment, for example, a liquid crystal projector, using the liquid crystal panel as a light valve, generally, an image component is formed in a respectively different liquid crystal panel for every color through red, blue, and a green light in three primary colors, these image components are compounded, and a desired color picture is made, and it consists of the former so that it may project ahead.
[0003] When compounding the image component of the three above-mentioned color, a cubic-like dichroic prism is used. By carrying out contiguity arrangement of every one liquid crystal panel at two side faces and the front, respectively, and irradiating the light of three colors among the 4th page of the peripheries of a dichroic prism, at three liquid crystal panels, respectively There are some which are constituted so that a synthetic image may be made to inject from the tooth back of a dichroic prism by introducing the image component of two of three colors from the side face of a dichroic prism, reflecting it alternatively, and making the image component of the one remaining colors introduce and penetrate from a transverse plane.
[0004] As a liquid crystal panel used for the above-mentioned liquid crystal projector, the active-matrix panel of TN mold is common. This liquid crystal panel pours in the liquid crystal layer of TN mold between two transparence substrates, arranges two polarizing plates which made the outside of a transparence substrate, and the light transmission shaft cross at right angles mutually, and by [in which it was formed in the shape of a matrix] impressing electric field for every pixel, it is constituted so that a light transmission condition may be changed. Active components, such as a TFT (thin film transistor) component and an MIM (metal-insulator -) component, are formed in one side of a transparence substrate, and a desired video signal can be alternatively impressed now for every pixel electrode.
[0005] The outline configuration of the liquid crystal equipment (liquid crystal panel module) used for the liquid crystal projector using such a conventional liquid crystal panel is explained using drawing 19 . The outline configuration of the liquid crystal panel 10 is carried out from the active-matrix substrate 11 with which a thin film transistor (TFT is called hereafter), the data line, the scanning line, a capacity line, etc. for a transparent pixel electrode, the orientation film, and pixel switching were formed, the opposite substrate 12 with which a transparent counterelectrode and the orientation film were formed, and the liquid crystal layer 13 which is poured into effective viewing-area 10a between these substrates 11 and 12, and is pinched. The liquid crystal in TN (Twisted Nematic) mode which twisted and carried out orientation to 90 degrees between substrates as liquid crystal poured in here with the orientation film on the inside of the active-matrix substrate 11 and the opposite substrate 12 is used widely. Thus, in the active-matrix substrate 11, the orientation condition in the liquid crystal layer 13 is controllable by the constituted liquid crystal panel 10 between a pixel electrode and a counterelectrode with the picture signal impressed to the pixel electrode from the data line through TFT. The part of the liquid crystal layer 13 which a pixel electrode and a counterelectrode counter can control now the optical condition separately realized independently with liquid crystal as a pixel field. In addition, on the inside

of the opposite substrate 12, light-shielding film 12a for dividing the effective viewing area and non-display field where the above-mentioned pixel field was arranged is formed.
[0006] On the external surface of the active-matrix substrate 11 of a liquid crystal panel 10, and the opposite substrate 12, face bonding is carried out by the transparence adhesives which the opposite substrate 12 which consists of glass etc. does not illustrate. These opposite substrates 12 are formed in order to prevent that the image quality of the image formed with a liquid crystal panel 10 deteriorates, if a blemish is attached on the external surface of the active-matrix substrate 11 and the opposite substrate 12 or dust has adhered. It can prevent that the blemish on the external surface of the active-matrix substrate 11 and the opposite substrate 12 is hidden optically, and dust adheres on the external surface of the active-matrix substrate 11 and the opposite substrate 12 with the opposite substrate 12 by which face bonding was carried out through transparence adhesives. Although a blemish may be formed also on the external surface of the opposite substrate 12 or dust may adhere, since distance has separated these external surface from the liquid crystal layer 13, the effect of the blemish on these external surface or the image on dust is reduced according to the defocusing effectiveness.
[0007] The panel assembly which becomes the above-mentioned active-matrix substrate 11 and the opposite substrate 12, and a list from the transparence substrates 1 and 2 is held in the interior of the case object 20 which has protection-from-light nature where adhesives are applied, and adhesion immobilization is carried out by stiffening adhesives in the condition of having equipped with the holder 24, by making it engage with the engagement section 23 of a case object.
[0008] To the above-mentioned liquid crystal panel module, the light emitted from the light source in a projection mold display is irradiated through a condensing system. Here, incidence of the incident light I of illustration is carried out to the transparence substrate 2 from the direction which intersects perpendicularly to the liquid crystal layer 13. Incident light I penetrates the transparence substrate 2 and the opposite substrate 12, and receives predetermined light modulation in the liquid crystal layer 13, it penetrates the active-matrix substrate 11 and the transparence substrate 1, and outgoing radiation is carried out.
[0009]
[Problem(s) to be Solved by the Invention] Thus, in the constituted liquid crystal panel 10, as shown in drawing 20 which drew the orientation condition of liquid crystal typically, liquid crystal 13LC is in the condition of having twisted and carried out orientation to 90 degrees between the active-matrix substrate 11 and the opposite substrate 12. In order to give such a 90-degree twist to liquid crystal 13LC, after forming the polyimide film used as the orientation film etc. in the front face of the active-matrix substrate 11 and the opposite substrate 12, as an arrow head A and an arrow head B show each direction of rubbing, after performing rubbing processing in the direction which makes the right angle of each other between the substrates of a pair, respectively, lamination and its clearance are filled up with liquid crystal 13LC for the active-matrix substrate 11 and the opposite substrate 12. Consequently, liquid crystal 13LC turns and carries out orientation of the direction of a major axis in the direction of rubbing to the orientation film, and the 90 degrees of the directions of a major axis of liquid crystal 13LC are twisted between the substrate 11 of a pair, and 12. Here, in drawing 20 , in the direction A of orientation of the active-matrix substrate 11, it is in the positive direction of a Y-axis about the direction B of orientation of the opposite substrate 12, and is in the negative direction of the X-axis for the negative direction of the Z-axis about the direction of incidence of incident light I.
[0010] Thus, it is twisted and a contrast property shows directivity according to the orientation condition (bearing of a major axis, and inclination of a major axis) of a substrate 11 and liquid crystal 13LCC located in the center between 12 in the liquid crystal panel 10 using liquid crystal 13LC which carried out orientation. Namely, if bearing at the time of projecting the major axis of liquid crystal 13LCC on a panel side is made into a direction parallel to L shaft and the bearing concerned and bearing which intersects perpendicularly are made into a direction parallel to S shaft when carrying out orientation of the liquid crystal 13LC, as shown in drawing 20 , L shaft and S shaft will become in the direction which has the include angle of 45 degrees on XY flat surface to about X shafts and a Y-axis. In this case, the contrast property at the time of seeing from the direction included in the flat surface (it is called SZ flat surface.) containing S shaft and the Z-axis turns into a symmetrical property to the Z-axis, as shown in drawing 21 . Here, the viewing angle phi is the include angle of the direction of a look included in the above-mentioned SZ flat surface over the Z-axis as shown in drawing 23 . On the other hand, as the contrast property at the time of seeing from the direction included in the flat surface (it is called LZ flat surface.) containing L shaft and the Z-axis is shown in drawing 22 , if there is a peak of contrast in bearing which shifted from Z shaft orientations to the forward side of L shaft a little and it separates,

contrast will fall sharply. For example, in the negative side of L shaft, contrast falls remarkably. When such, the direction of the forward side of L shaft is called direction of clear vision, and an opposite direction is called with it direction of reverse clear vision. Here, the viewing angle theta is the include angle of the direction of a look seen from the direction included at the above-mentioned LZ flat surface over the Z-axis as shown in drawing 23 . Moreover, the clear vision include angle theta 0 is the value of the viewing angle theta from which the peak of a contrast ratio is acquired, and although it changes with a property, an inclination, etc. of a liquid crystal molecule in a liquid crystal panel, it is usually about 2 - 8 times.

[0011] By the way, in the above-mentioned liquid crystal projector, the image component reflected among each image component modulated with the liquid crystal panel by the selective reflection side in a dichroic prism and the image component which penetrates a dichroic prism are compounded, where mirroring is carried out mutually. In a liquid crystal projector, the image component which carried out mirroring of the panel for green to the object for red and the panel for blue is compounded with a dichroic prism among red, blue, and the image component of each panel for green. Two or more liquid crystal panels installed in a liquid crystal projector at this time have the trouble that color nonuniformity may occur to the subject-copy image which it is going to reproduce, when the bearing dependency existed in the optical property of a liquid crystal panel and the image component of a different color by which mirroring was carried out mutually is compounded, since the same thing was usually used mutually.

[0012] Usually, it sets to projection mold displays, such as a liquid crystal projector. Unlike the case of a common liquid crystal display panel, the viewing-angle dependency itself hardly affects a playback image for the reason of the viewing-angle range where visibility is good being limited, but a liquid crystal panel It also has the property that contrast and brightness change, with not the angle of visibility itself but the bearing dependency of an optical property, i.e., the azimuth of a look, and field internal division cloth peculiar to the contrast and brightness of an image component is generated with this bearing dependency. For example, when the above-mentioned direction of clear vision which becomes settled according to the direction of rubbing and the direction of torsion of a liquid crystal molecule exists in a TN liquid crystal and it sees from clear vision, in the field where an angle of visibility is low, contrast increases rather than the direction of a normal over a liquid crystal panel not to mention other directions. When this direction of clear vision is especially shifted from the direction of the symmetry axis of mirroring of an image component, in order that the direction which corresponds in the direction of clear vision in an image component by mirroring may be reversed, it becomes the cause of the color nonuniformity in a synthetic image.

[0013] Then, this invention solves the above-mentioned trouble and the technical problem is in offering the structure of the possible liquid crystal panel of reducing the color nonuniformity produced by the contrast in two or more image components hung down even if it originates in the bearing dependency of the optical property of a liquid crystal panel, or dispersion of brightness in a projection mold display.

[0014]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem the liquid crystal panel of this invention In the liquid crystal panel with which it came to pinch a liquid crystal layer, and two or more pixels were arranged between the substrates of said pair between the substrates of a pair It is characterized by the 2nd block of the thing which consist of the 1st block which it comes to give orientation processing of liquid crystal to the liquid crystal layer side of one [at least] substrate of the substrate of said pair, and consists of two or more pixels of one [said] substrate, and two or more pixels and which the orientation processing directions of liquid crystal differ mutually.

[0015] Since according to this invention orientation conditions differ, the directions of clear vision will differ mutually for every block and the direction of clear vision bias-comes to be hard of two or more blocks in the specific direction as the whole liquid crystal panel, respectively, even if it carries out mirroring of the image formed with the liquid crystal panel concerned, the effect on the image quality resulting from change of the direction of clear vision decreases. When compounding the image component which followed, for example, was formed with two or more liquid crystal panels and forming a synthetic image, where mirroring is carried out, even if between each image component is compounded, the color nonuniformity resulting from a difference of the direction of clear vision etc. can be reduced.

[0016] Moreover, come to pinch a liquid crystal layer between the substrates of a pair, and the liquid crystal panel of this invention is set to the liquid crystal panel which comes to prepare the effective viewing area by which two or more pixels were arranged between the substrates of said pair. It comes to give orientation

processing of liquid crystal to one [at least] substrate of the substrate of said pair. In said effective viewing area The 2nd block of the orientation processing directions of liquid crystal differs mutually. it consists of the 1st block which consists of two or more pixels of one [said] substrate, and two or more pixels -- the 1st and said 2nd block While being formed so that it may become axial symmetry to the symmetry axis which carries out abbreviation bisection of said effective viewing area, it is characterized by being constituted so that said the 1st and block [2nd] direction of clear vision which have been arranged at the position of symmetry of the both sides of said symmetry axis may become axial symmetry to said symmetry axis.

[0017] While according to this invention two or more blocks are formed in an effective viewing area, and being formed so that two or more blocks may become axial symmetry to the symmetry axis which carries out abbreviation bisection of the effective viewing area By being constituted so that the direction of clear vision of said blocks arranged at the position of symmetry of the both sides of said axis of symmetry may become axial symmetry to said axis of symmetry Since the effect on the image quality resulting from change of the direction of clear vision is almost lost even if it carries out mirroring of the image formed with the liquid crystal panel concerned When compounding the image component formed with two or more liquid crystal panels and forming a synthetic image, where mirroring is carried out, even if between each image component is compounded, the color nonuniformity resulting from a difference of the direction of clear vision etc. can be reduced.

[0018] Here, not only the direction of clear vision but the array condition of a block may not be axial symmetry to a symmetry axis. Moreover, it may be constituted so that the block arranged as straddled the axis of symmetry may be included.

[0019] As for the 1st and said 2nd block, in each above-mentioned invention, it is desirable to be formed by changing partially the orientation processing conditions over the front face which attends said liquid crystal layer of one [said] substrate.

[0020] Since the orientation condition of a liquid crystal molecule is controllable by changing partially the orientation processing conditions on the front face of a substrate according to this invention, the block with which two or more directions of clear vision differ can be formed without changing the structure of the conventional liquid crystal panel.

[0021] Moreover, come to pinch a liquid crystal layer between the substrates of a pair, and the liquid crystal panel of this invention is set to the liquid crystal panel which comes to prepare the effective viewing area by which two or more pixels were arranged between the substrates of said pair. It comes to give orientation processing of liquid crystal to one [at least] substrate of the substrate of said pair. While said effective viewing area has four blocks constituted by dividing into axial symmetry to an up-and-down symmetry axis and a symmetry axis on either side, respectively and the directions of clear vision of said four blocks differ mutually, it is characterized by being constituted so that it may become axial symmetry to said symmetry axis.

[0022] Since according to this invention the direction of clear vision of an effective viewing area is constituted to the symmetry axis of both right and left and the upper and lower sides so that it may become axial symmetry Since the effect on the image quality to which an image originates in change of the direction of clear vision also to mirroring of not only the case of mirroring to right and left but the upper and lower sides is almost lost When compounding the image component formed with two or more liquid crystal panels and forming a synthetic image, where mirroring is carried out, even if between each image component is compounded, the color nonuniformity resulting from a difference of the direction of clear vision can be reduced.

[0023] Moreover, come to pinch a liquid crystal layer between the substrates of a pair, and the liquid crystal panel of this invention is set to the liquid crystal panel which comes to prepare the effective viewing area by which two or more pixels were arranged between the substrates of said pair. While, as for said two or more blocks, the orientation processing directions of liquid crystal differ by coming to give orientation processing of liquid crystal to one [at least] substrate of the substrate of said pair, and said effective viewing area having two or more blocks which consist of two or more pixels The direction of clear vision of a block of said plurality is characterized by not being axial symmetry to the symmetry axis of said effective viewing area.

[0024] In the number of blocks, though each direction of clear vision of two or more blocks was formed in the random instead of axial symmetry to the axis of symmetry of an effective viewing area according to this invention, if, for example it is 24 or more pieces, generating of the color nonuniformity of a synthetic image will be controlled and will not be conspicuous.

[0025] Next, as the manufacture approach of a liquid crystal panel, come to pinch a liquid crystal layer between

the substrates of a pair, and it sets to the manufacture approach of a liquid crystal panel of coming to prepare the effective viewing area by which two or more pixels were arranged between the substrates of said pair. Orientation processing is performed on the orientation processing conditions predetermined to the 1st block which consist of two or more pixels to the front face which attends said liquid crystal layer of one [at least] substrate of the substrate of said pair. It is characterized by performing orientation processing to the 2nd block which consists of two or more pixels on predetermined orientation processing conditions which are different in the 1st block, sticking the substrate of said pair on after an appropriate time, pouring in liquid crystal between them, and forming said liquid crystal layer.

[0026] Since according to this invention two or more blocks are formed in an effective viewing area, orientation conditions differ for every block and the directions of clear vision will differ mutually for every block within an effective viewing area, the direction of clear vision bias-comes to be hard in the specific direction as the whole liquid crystal panel. Therefore, even if it carries out mirroring of the image formed with the liquid crystal panel concerned, the effect on the image quality resulting from change of the direction of clear vision decreases. Therefore, when compounding the image component formed with two or more liquid crystal panels and forming a synthetic image, where mirroring is carried out, even if between each image component is compounded, the color nonuniformity resulting from a difference of the direction of clear vision etc. can be reduced. Moreover, two or more blocks equipped with the different direction of clear vision can be formed, without having a complicated process, in order for what is necessary just to be to change orientation processing conditions partially.

[0027] In this invention, while being formed so that it may become axial symmetry to the symmetry axis with which the 1st and said 2nd block carry out abbreviation bisection of said effective viewing area, it is characterized by performing orientation processing so that said direction of clear vision (the 1st block and the 2nd block) arranged at the position of symmetry of the both sides of said symmetry axis may become axial symmetry to said symmetry axis.

[0028] While according to this invention two or more blocks are formed in an effective viewing area, and being formed so that two or more blocks may become axial symmetry to the symmetry axis which carries out abbreviation bisection of the effective viewing area By being constituted so that the direction of clear vision of said blocks arranged at the position of symmetry of the both sides of said axis of symmetry may become axial symmetry to said axis of symmetry Since the effect on the image quality resulting from change of the direction of clear vision is almost lost even if it carries out mirroring of the image formed with the liquid crystal panel concerned When compounding the image component formed with two or more liquid crystal panels and forming a synthetic image, where mirroring is carried out, even if between each image component is compounded, the color nonuniformity resulting from a difference of the direction of clear vision etc. can be reduced.

[0029] It is made for this invention to differ from the direction of torsion of said liquid crystal mutually in the 1st block and said 2nd block in the orientation processing direction of one [said] substrate, and is characterized by making the orientation processing direction over the substrate of another side of the substrate of said pair into said the 1st and direction where the 2nd block is the same.

[0030] Since the direction of orientation of the substrate of another side can be carried out in common, it becomes unnecessary to perform orientation processing for every block about the substrate concerned according to this configuration.

[0031] In this invention, liquid crystal common to the 1st and said 2nd block is poured in, and it is characterized by changing said the 1st and orientation condition of block [2nd] liquid crystal by changing the orientation processing direction over one [said / said] substrate (the 1st block and the 2nd block).

[0032] According to this configuration, since liquid crystal common between the substrates of a pair can be poured in, it is not necessary to prepare two or more inlets of liquid crystal, and two or more blocks can be easily formed according to the usual liquid crystal panel structure.

[0033] In each above-mentioned invention, it is desirable to perform orientation processing by beam exposure to the orientation film formed on the front face which attends said liquid crystal layer of one [said] substrate.

[0034] By irradiating beams, such as light, an electron ray, and ion, at the orientation film, by performing orientation processing, two or more blocks can be formed easily and, according to this invention, moreover, degradation of display grace can be controlled. Since there is no wrap need at a resist etc., a complicated process is not needed.

[0035] As for said beam exposure, in this invention, it is desirable that it is an ion beam exposure.
[0036] According to this configuration, compared with other beam exposures, since it is easy to control a beam exposure location and an exposure, a good orientation condition is acquired, and an ion beam exposure can stop poor orientation. Moreover, in this invention, it is desirable by irradiating said ion beam aslant on the front face of one [said] substrate, and changing exposure bearing of said ion beam partially to control the direction of liquid crystal orientation of said block.
[0037] Since the direction of orientation is changeable only by changing the direction of a substrate, or the sense of a beam exposure according to this configuration, orientation processing of a predetermined direction can be performed without having a complicated production process. Moreover, in each above-mentioned invention, the liquid crystal orientation processing direction of said block may be controlled by performing said beam exposure using the mask which covers the front face of said substrate partially.
[0038] Since according to this configuration it can process by package even if the block of the same orientation processing direction exists ranging over two or more places, the processing time can be shortened.
[0039] In addition, it is desirable to perform orientation processing which met in the wiring direction according to the direction of wiring which used the active-matrix substrate in an active matrix liquid crystal panel as the substrate of the method of top Norikazu especially in this case, and was formed on the active-matrix substrate.
[0040] Furthermore, in each above-mentioned invention, said pixel arranged in the shape of a matrix, the switching element formed for every pixel, and the data line and the scanning line with which this switching element is intersected for supplying potential may be formed, and the orientation condition of the liquid crystal of said block may be changed by performing orientation processing of said block in the direction which met this data line or the scanning line.
[0041] According to this invention, two or more blocks can be formed in the direction which met the crossing data line or the scanning line by performing orientation processing, but since the direction of orientation processing is set up in the direction which met the data line or the scanning line, when performing rubbing processing especially as an orientation art, the defect of the orientation processing by the level difference on the front face of a substrate formed of the wiring layer of the data line or the scanning line can be reduced.
[0042] It has two or more liquid crystal panels concerning each above-mentioned invention, it is constituted so that the synthetic image which comes to compound two or more image components by which light modulation was carried out with each liquid crystal panel may project, and said image component of at least 1 is the projection mold display characterized to other image components of said by to be constituted so that it may be compounded, where mirroring of the direction of clear vision of said liquid crystal panel is carried out to said symmetry axis extended in the different direction.
[0043] Since according to this invention two or more blocks are formed in a liquid crystal panel, and it has the direction of clear vision which is mutually different in that adjoining field section, or the direction of clear vision is formed in axial symmetry to the symmetry axis and the effect to the image which originates in the direction of clear vision can be reduced even if mirroring of the image formed with the liquid crystal panel is carried out, the color nonuniformity of a synthetic image can be reduced and a high-definition synthetic image can be obtained.
[0044]
[Embodiment of the Invention] Next, the operation gestalt which starts this invention with reference to an accompanying drawing is explained.
[0045] The whole projection mold display configuration in this operation gestalt is explained to the [projection mold display whole configuration] beginning. Drawing 1 shows the structure of the optical system of a projection mold display. As shown in drawing 1 , the projection mold indicating equipment 1100 prepares three liquid crystal display modules which are liquid crystal equipment containing the liquid crystal panel 10 mentioned above, and is constituted as a projector respectively used as light valves 100R, 100G, and 100B for R (red) G(green) B (blue). In a liquid crystal projector 1100, if incident light is emitted from the lamp unit 1102 of sources of the white light, such as a metal halide lamp, it will be divided into parts for Mitsunari R, G, and B corresponding to the three primary colors of RGB with the mirror 1106 of three sheets, and the dichroic mirror 1108 of two sheets, and will be respectively led to the light valves 100R, 100G, and 100B corresponding to each color. Under the present circumstances, especially B light is drawn through the relay lens system 1121 which consists of the incidence lens 1122, a relay lens 1123, and an outgoing radiation lens 1124, in order to prevent the optical loss by the long optical path. And after a part for Mitsunari corresponding to the three

primary colors respectively modulated with light valves 100R, 100G, and 100B is again compounded with a dichroic prism 1112, it is projected on it by the screen 1120 as a color picture through a projector lens 1114.
[0046] In such a liquid crystal projector 20, although the image component formed with the liquid crystal light valves 100R and 100B among each image component by which modulation formation was carried out with each liquid crystal light valves 100R, 100G, and 100B is reflected in the alternative reflector in a dichroic prism 1112 when it is what drawing 1 displays the cross section of equipment as, the image component formed of liquid crystal light valve 100G penetrates a dichroic prism 1112 as it is, without being reflected. Therefore, the image component formed based on the flux of lights R and B and the image component formed based on the flux of light G will be compounded by the longitudinal direction where mirroring is mutually carried out as a symmetry axis, and vertical axes will be ahead projected on it.
[0047] As shown in drawing 2 and drawing 3 , the liquid crystal panel 10 which constitutes the [structure of liquid crystal panel] above-mentioned liquid crystal light valves 100R, 100G, and 100B pours in liquid crystal 13 into liquid crystal impregnation field 10a which was stuck so that the active-matrix substrate 11 and the opposite substrate 12 which consist of glass etc. might have a predetermined gap (cel gap) through a sealant 14, and was constituted inside the sealant 14, and is constituted. Liquid crystal 13 is poured in from liquid crystal inlet 14a prepared in the sealant 14, and liquid crystal inlet 14a is blocked by the encapsulant 15 which consists of resin etc. after that. As a sealant 14, an epoxy resin and various kinds of photo-setting resins can be used. In order to secure a cel gap, the fiber of inorganic [which was equipped with the particle size (about 2-10 micrometers) equivalent to a cel gap in the sealant 14] or the quality of organic or a solid sphere is mixed.
[0048] The active-matrix substrate 11 is equipped with big surface area a little rather than the opposite substrate 12, and active components, such as wiring layers, such as the data line and the scanning line, a transparent electrode, and TFT (thin film transistor), are formed in the inside corresponding to many pixels. The transparent electrode corresponding to a pixel is formed also in the inside of the opposite substrate 12. Light-shielding film 12a formed in the shape of the circumference in the inside of the formation field of a sealant 14 is formed in the outside of the field corresponding to a pixel of the inside of the opposite substrate 12.
[0049] Circuit pattern 11a connected conductively to the wiring layer formed on the inside of the active-matrix substrate 11 and the opposite substrate 12 is formed in the outside of the formation field of the sealant 14 on the inside of the active-matrix substrate 11, and the scanning-line drive circuit 17 and the data-line drive circuit 18 are formed according to this circuit pattern 11a. Furthermore, external terminal area 11b to which many external terminals 19 arranged the rim section by the side of one of the active-matrix substrate 11 is constituted, and wiring members, such as the flexible wiring substrate 16, are connected conductively through the anisotropy electric conduction film etc. to this external terminal area 11b.
[0050] What suited the liquid crystal panel in the various modes, such as IPS (inch-plain switching) mode besides TN mold and a STN mold and VA (vertically aligned) mode, can be used for liquid crystal 13. With the above-mentioned liquid crystal panel 10, it is attached according to the class of liquid crystal 13 to be used, a mode of operation, a display mode (Nor Marie White, Nor Marie Black), etc. with the posture which turned the polarization film, the phase contrast film, the polarizing plate, etc. to predetermined bearing.
[0051] The representative circuit schematic on the active-matrix substrate 11 (component substrate) in the case of constituting the liquid crystal panel of the active-matrix mold which used TFT is shown, and the plane configuration on the same active-matrix substrate 11 is expanded and shown in drawing 5 , and the cross-section structure cut along with the VI-VI line of drawing 5 is typically shown in drawing 4 at drawing 6 . As shown in drawing 4 , on the active-matrix substrate 11, it is formed so that the scanning line 101 and the data line 103 may stand in a row in all directions, respectively, and the scanning line 101 is connected to the gate of TFT104 formed for every pixel, and the source of TFT104 is connected to the data line 103. The drain of TFT104 is electrically connected also to storage capacitance 105 while connecting with the pixel electrode 106 electrically. Storage capacitance 105 is connected to the capacity line 102. As an approach of forming this storage capacitance 105, you may form between the scanning lines 101 of the preceding paragraph instead of the capacity line 102.
[0052] It is impressed for every group who makes a group two or more data lines which the scan signal Gn is impressed to the scanning line 101 by line sequential in pulse, and a picture signal Sn is impressed to the data line 103 line sequential, or adjoin each other. TFT104 writes the potential according to data signal Sn in the pixel electrode 106 suitably according to the scan signal Gn. The pixel electrode 106 counters the counterelectrode which was formed on the inside of the opposite substrate 12 through the liquid crystal layer

which is not illustrated and which is not illustrated, and gives desired electric field to a liquid crystal layer between the counterelectrodes with which predetermined potential is supplied. Drawing 5 shows the top view of a pixel and drawing 6 is the VI-VI sectional view of drawing 5 .

[0053] As shown in drawing 5 and drawing 6 , TFT104 extends to the field shown in drawing 5 with an illustration slash, the source 1041 is connected conductively in opening 1041a to the data line 103, and the gate 1042 counters through the thin insulator layer which intersects the scanning line 101 and is not illustrated. A drain 1043 is connected conductively to the pixel electrode 106 through opening 1043a. The bottom electrode 1040 which extended from such structures laps superficially through the capacity line 102 and an insulating layer, and constitutes the above-mentioned storage capacitance 105. Storage capacitance 105 is for carrying out long duration maintenance of the potential of the pixel electrode 106 to leak of a charge so that it may be well-known.

[0054] [Relation between 1st orientation art, and orientation processing and direction of clear vision] drawing 7 shows the relation between the direction of rubbing over each substrate front face of the active-matrix substrate 11 in the case of forming the active-matrix type liquid crystal panel of the above-mentioned TN mold, and the opposite substrate 12, and the direction of clear vision of the formed liquid crystal panel. In drawing 7 , the condition of having seen the active-matrix substrate 11 and the opposite substrate 12 for the liquid crystal panel 10 in piles from the incidence side is shown. Void Rhine in every direction in drawing shows wiring structure (or array structure of a pixel) typically, in order to show the extended direction of the scanning line and the data line on the active-matrix substrate 11. Supposing void Rhine extended in one direction is the scanning line, void Rhine extended in another direction shows the data line.

[0055] In a general liquid crystal projector, since a projection image is set up oblong, a liquid crystal panel is installed in equipment, where a longitudinal direction is made into a longitudinal direction, as shown in drawing 7 . In the above-mentioned liquid crystal panel 10, the orientation film which consists of polyimide etc. is formed on the inside of the active-matrix substrate 11 and the opposite substrate 12, and rubbing processing is performed by grinding the front face of this orientation film with cloth etc. But it may go to the front face of the usual insulator layer, without forming the orientation film used only for orientation especially as rubbing processing, inorganic film other than the organic film may be used, or mechanical rubbing processing may be made unnecessary by forming a coat using the slanting vacuum deposition of non-element material etc.

[0056] Usually, the direction of clear vision of a liquid crystal panel serves as the illustration upper part by carrying out rubbing processing by direction of rubbing R (11) turned to the upper left from the illustration lower right to the active-matrix substrate 11, carrying out rubbing processing by direction of rubbing R (12) turned to the lower left from the illustration upper right to the opposite substrate 12, and carrying out the direction of torsion of 90 degrees of liquid crystal in the direction of S of illustration. In the direction of clear vision being determined by the direction of rubbing of the active-matrix substrate 11 and the opposite substrate 12, and the direction of torsion of liquid crystal and performing rubbing processing aslant to the wiring direction like illustration, the direction of clear vision turns into the direction of either of vertical and horizontal.

[0057] If the liquid crystal panel whose direction of clear vision is the upper part is installed in the liquid crystal projector 20 shown in drawing 1 with the posture shown in drawing 7 as liquid crystal light valves 100R, 100G, and 100B as shown in drawing 7 Since mirroring of the image component of the flux of lights R and B is only carried out to the longitudinal direction to the image component of the flux of light G among three image components, the direction of clear vision in three image components all serves as the upper part after composition, and the direction of clear vision does not change with image components.

[0058] The direction of clear vision becomes illustration right-hand side by changing the direction of rubbing in the direction which drawing 7 is made to rotate the direction of rubbing of the active-matrix substrate 11 180 degrees as a dotted line shows on the other hand, and is shown by AR (11), and making the direction of torsion of liquid crystal into the direction of AS of illustration. In this case, if the image component of the flux of lights R and B is carrying out mirroring to right and left to the image component of the flux of light G as mentioned above, the direction of clear vision will also become right-and-left reverse, and color nonuniformity will occur in a synthetic image.

[0059] As mentioned above, when making the direction of rubbing slanting (making it incline whenever [45]) to the wiring direction and performing it, the direction of clear vision can be set up up and down, and it is used for the usual liquid crystal display panel etc. as it is. However, it is not desirable, when poor orientation may

occur and display quality is raised by existence of the level difference of wiring (scanning line or data line) in this case. Since it is necessary to form high definition pixel structure in a panel area smaller than usual as a liquid crystal panel especially used for projection mold displays, such as a liquid crystal projector, there is a trouble of being easy to generate the poor orientation resulting from a wiring level difference. So, with this operation gestalt, generating of the poor orientation resulting from a wiring level difference is reduced by performing the direction of rubbing along the wiring direction.

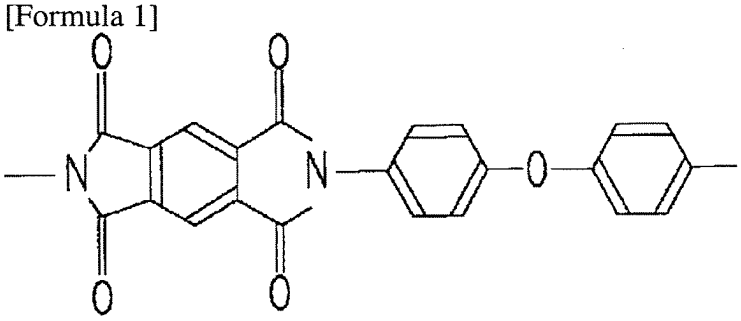
[0060] The situation in the case of performing rubbing processing along the wiring direction is shown in drawing 8 . If direction [of the active-matrix substrate 11] of rubbing R (11) is made into the direction which goes upwards from under illustration, direction [of the opposite substrate 12] of rubbing R (12) is made into the direction which goes to the left from the illustration right and the direction of torsion of liquid crystal is carried out in the direction of S, the direction of clear vision will turn into the direction of the upper right like illustration. Thus, if the direction of rubbing is set up in the wiring direction, the direction of clear vision will surely turn into the direction of slanting to the wiring direction. Therefore, if it installs in a liquid crystal projector as a liquid crystal light valve shown in drawing 1 as it is with the posture shown in drawing 8 From being compounded where mirroring of the image component based on the flux of lights R and B and the image component based on the flux of light G is carried out to right and left Color nonuniformity will occur in that in which the direction of clear vision of the color tone component of the flux of lights R and B and the direction of clear vision of the color tone component of the flux of light G carry out right-and-left reversal in a synthetic image (diagonal right and diagonal left). In addition, in the example shown in drawing 8 , if it sets up in the direction AR of rubbing (12) which shows the direction of rubbing of the opposite substrate 12 by the illustration dotted line which is the above-mentioned opposite direction and moreover sets up in the direction of AS which shows the direction of torsion of liquid crystal by the illustration dotted line, as an illustration dotted line shows, the direction of clear vision will turn into the direction of the diagonal left.

[0061] When performing rubbing processing in the direction of slant like drawing 7 , drawing 9 changes the direction of rubbing of the both sides of the active-matrix substrate 11 and the opposite substrate 12, and considers as the directions AR (11) and AR of rubbing (12), and the direction S of torsion of liquid crystal shows the example in the case of changing the direction of clear vision, without changing. Moreover, when performing rubbing processing in the wiring direction like drawing 8 , drawing 10 changes the direction of rubbing of the both sides of the active-matrix substrates 11 and 12, and considers as the directions AR (11) and AR of rubbing (12), and the direction S of torsion of liquid crystal shows the example in the case of changing the direction of clear vision, without changing.

[0062] [Orientation art of ** 2nd] drawing 11 shows the orientation art using the ion irradiation method as an option from which the orientation art by the above rubbing processings differs. In this approach, first, after forming the necessary surface structures 111, such as wiring, an electrode, and an active component, in the front face of the active-matrix substrate 110, an orientation material is extensively applied on the inside of the active-matrix substrate 110 with a spin coat method etc. As an orientation material, a fusibility type polyimide material, the polyimide material which needs polymerization hardening, a polyamic acid type polyimide material, etc. can be used. A fusibility type polyimide material can perform orientation processing, applied. Other orientation materials are usually stiffened by desiccation or baking.

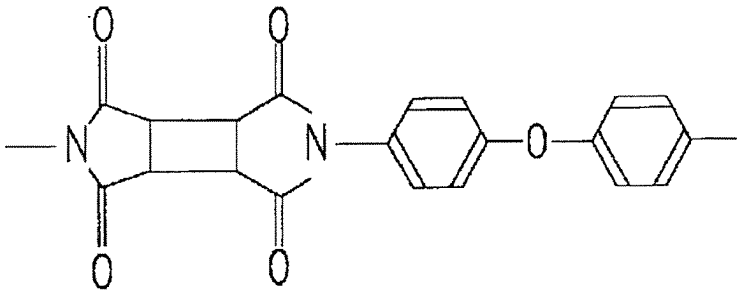
[0063] As a fusibility type polyimide material, it is [0064].

[Formula 1]

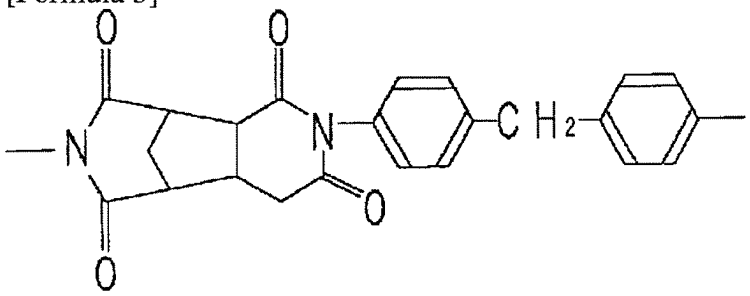


[0065]

[Formula 2]



[0066] It is suitable especially in order that a thing with which principal chain may realize high electrical-potential-difference retention, uniform liquid crystal orientation, and a high pre tilt angle.
[0067] Moreover, as a polyamic acid type polyimide material, it is [0068].
[Formula 3]



[0069] There is a thing equipped with the structure of ********.
[0070] The active-matrix substrate 110 which formed the orientation film 112 on the front face as mentioned above was introduced in the chamber of ion irradiation equipment. And made the interior of a chamber into the vacuum, Ar ion was made to emit from the ion source 121, and it accelerated and irradiated with the accelerating electrode 122.
[0071] This ion irradiation is for performing orientation processing to the orientation film 112. The degree of vacuum at this time is 5x10-3torr, an ion irradiation include angle is psi= 45 degrees, and it is acceleration voltage 100 V and current density [of 20micro] A/cm2. Ar ion was irradiated on conditions. Moreover, orientation processing was carried out on this exposure condition, moving the active-matrix substrate 110 in the direction of an illustration arrow head (namely, direction which is a direction parallel (contained) to the panel side of the transparence substrate 10, and goes to bearing in which the ion source 121 inclines to a panel side) by 1cm/second in rate (scan). Of course, the ion source 121 may be scanned instead of the active-matrix substrate 110.
[0072] Since it is dependent on the relation of whenever [ion acceleration voltage, pre tilt angle / of a liquid crystal molecule / and relation / of whenever / orientation order /, illuminating-angle whenever and pre tilt angle, and orientation order], the relation between a degree of vacuum and whenever [orientation order], etc., the orientation condition by ion irradiation acquires these relation as data beforehand, and it is desirable to optimize the conditions of the ion irradiation in orientation processing from these data.
[0073] As ion acceleration voltage, it is high in a pre tilt angle, and in order to make whenever [orientation order] high, it is desirable that it is more than 100V and less than [200V]. Moreover, it is [whenever / pre tilt angle and illuminating-angle / of the viewpoint of whenever / orientation order / to ion] desirable [especially psi] similarly that it is 45-50 degrees 40-50 degrees. Furthermore, the degree of vacuums at the time of ion irradiation are 10-1 - 10-4torr, and it is desirable that the distance L from the ion irradiation opening to the orientation film 112 is moreover 1mm or more 300mm or less.
[0074] It is desirable that it is within the limits whose thickness after orientation processing of the orientation film 112 is 10-100nm especially as a liquid crystal display in order to lessen effect of the voltage drop by the orientation film and to secure sufficient orientation restraining force moreover.
[0075] In performing orientation processing on partially different orientation processing conditions on the front face of the active-matrix substrate 11 so that it may mention later, when carrying out orientation processing by the above-mentioned approach, to the orientation film 112, as shown in drawing 11 (b), the metal mask 113 is set, ion irradiation is performed, and it is made not to perform orientation processing to field 112a covered with

the mask 113. Next, to the above-mentioned field 112, psi is set up towards different bearing whenever [illuminating-angle / of an ion beam], and orientation processing is performed where the front face of the orientation film 112 by which orientation processing was already carried out is covered with a mask 113. By doing in this way, the liquid crystal orientation field which carries out orientation of the liquid crystal molecule can be formed in the different direction to the orientation film 112 on the active-matrix substrate 11.

[0076] A further different orientation art is explained with reference to [the 3rd orientation art], next drawing 12 . In order to form division orientation panel structure in a high definition liquid crystal panel so that it may mention later, the rubbing processing performed by contact of a rubbing roller, a buff, etc. has many problems. For this reason, it is desirable to perform optical orientation processing performed by irradiating ultraviolet rays etc. at the orientation film. This optical orientation processing is performed by the approach shown below. First, after applying orientation film ingredients, such as an organic macromolecule, on the front face of the transparence substrate 71, as shown in drawing 12 (a), it calcinates and the orientation film 72 is formed. Then, as shown in drawing 12 (b), the ultraviolet rays 74 which polarized in the direction which arranges the optical mask 73 of a predetermined pattern on the orientation film 72, for example, intersects perpendicularly with space are irradiated almost at right angles to the front face of the transparence substrate 71, and orientation ****** field section (block) 72a which consists of two or more pixels is formed. Next, as shown in drawing 12 (c), using the optical predetermined mask 75 on which the surface part of orientation film 72 which is different in the above-mentioned mask 73 is exposed, ultraviolet rays 76 are irradiated alternatively at the orientation film 72, and orientation processing field section (block) 72b which consists of two or more pixels is formed. These ultraviolet rays 76 polarize in the direction (illustration longitudinal direction) rotated 90 degrees to the polarization direction of the ultraviolet rays 74 shown in drawing 12 (b). Thus, by performing ultraviolet-rays exposure for the processed transparence substrate 71 similarly, by sticking with the opposite substrate 77 which has the orientation film 78 processed so that two or more blocks which performed similarly different orientation processing might be formed, as shown in drawing 12 (d), a liquid crystal panel 70 can be formed. By irradiating the ultraviolet rays which polarized in the specific direction as a material of the orientation film 72 and 78 here, the orientation film molecule which carried out orientation is disassembled in the specific direction, and what has liquid crystal stacking tendency ability similar to the case where orientation processing (rubbing processing) is carried out (what has an optical stacking tendency) is used in the specific direction and the direction which intersects perpendicularly. The liquid crystal orientation field sections 79a and 79b to which orientation of the liquid crystal molecule was carried out are formed in mutually different bearing by two or more blocks irradiated by the ultraviolet rays of polarization bearing which changes with these properties. Here, as an organic material which has the above optical stacking tendencies, PVCi (Aldrich make), s610 (the Nissan chemistry company make), etc. can be used, for example.

[0077] Based on the [1st operation gestalt], next the above-mentioned explanation, the 1st operation gestalt of the liquid crystal panel concerning this invention is explained. Drawing 13 is the explanatory view showing typically the direction of clear vision of the effective viewing area of the liquid crystal panel of the 1st operation gestalt. With this operation gestalt, Blocks (liquid crystal orientation field section) 10A and 10B are formed at every one both sides of axis-of-symmetry 10X which bisects the effective viewing-area 10a concerned in effective viewing-area 10a which held the liquid crystal pinched by the active-matrix substrate 11 and the opposite substrate 12 as shown in drawing 13 . By changing the conditions of orientation processing mutually, these blocks 10A and 10B are formed so that the orientation conditions of a liquid crystal molecule may differ. Moreover, Blocks 10A and 10B are constituted so that it may become a flat-surface configuration symmetrical with mutual in the both sides of symmetry-axis 10X.

[0078] for example, as an approach of changing the orientation condition of each blocks 10A and 10B When using the 1st above-mentioned orientation art, rubbing processing of direction of rubbing R (11) shown in the active-matrix substrate 11 in block 10A at drawing 8 is performed. Rubbing processing of the direction AR of rubbing (12) shown in the opposite substrate 12 by the dotted line at drawing 8 is carried out, and it constitutes so that a liquid crystal panel may have the direction of clear vision of the method of the illustration diagonal left, as liquid crystal equips drawing 8 with the direction AS of torsion shown by the dotted line. On the other hand, in block 10B, as shown in drawing 8 , rubbing processing of direction of rubbing R (11) is performed to the active-matrix substrate 11, rubbing processing of direction of rubbing R (12) is carried out to the opposite substrate 12, and it constitutes so that a liquid crystal panel may have the direction of clear vision diagonally across to the right of illustration, as liquid crystal is equipped with the direction S of torsion. In this case, in

performing rubbing processing to one block, it carries out as a condition which covered the substrate front face of a block of another side with the resist layer etc.

[0079] Consequently, as an illustration arrow head shows Blocks 10A and 10B, that direction of clear vision serves as axial symmetry (mirroring condition) mutually to symmetry-axis 10X. Therefore, two or more liquid crystal panels 10 are used for projection mold indicating equipments, such as an above-mentioned liquid crystal projector, as a light valve. Where mirroring of the image component formed of one of the liquid crystal panels 10 is carried out to the image component formed with other liquid crystal panels, when being compounded, Since the direction of clear vision will not change to the case of not being reversed at all even if an image carries out mirroring with this operation gestalt, the color nonuniformity resulting from the directions over the image of the direction of clear vision differing etc. can be reduced.

[0080] Especially, by the above-mentioned approach, the direction of clear vision is changed by changing the direction of rubbing of the opposite substrate 12 (opposite substrate), and the direction of torsion of liquid crystal, without changing direction [of the active-matrix substrate 11] of rubbing R (11). For this reason, since it is not necessary to set up the direction of orientation which is different on the orientation film to the active-matrix substrate 11, manufacture processing can be made easy.

[0081] In addition, as a continuous line shows, rubbing processing of direction of rubbing R (11) is performed to the active-matrix substrate 11 at drawing 8 . In performing rubbing processing of direction of rubbing R (12) to the opposite substrate 12 The direction of rubbing of the active-matrix substrate 11 is changed into the opposite direction of above-mentioned rubbing direction R (11) to the direction of clear vision of a liquid crystal panel turning into the direction of the illustration upper right. When the direction of torsion of liquid crystal is made into the direction of AS, without changing the direction of rubbing of the opposite substrate 12, the direction of clear vision turns into the direction of the illustration lower right. In this case, by using the liquid crystal panel which has the direction of clear vision of the direction of the illustration upper right, and the liquid crystal panel which has the direction of clear vision of the direction of the illustration lower right, if it is the configuration of a liquid crystal projector in which the relation between two or more image components carries out mirroring up and down at the time of composition of an image component, the inequality of the direction of clear vision by mirroring is avoidable similarly.

[0082] By the above-mentioned approach, since it is necessary to use the liquid crystal which has the different direction of torsion in Blocks 10A and 10B, it is necessary to also divide and form a liquid crystal layer. Thus, as an approach of carrying out division formation of the liquid crystal layer, there are the following approaches, for example. First, the partition part into which it divides between blocks is formed by the sealant etc. between the active-matrix substrate 11 and the opposite substrate 12, a liquid crystal inlet is prepared for every block, and the active-matrix substrate 11 and the opposite substrate 12 are stuck. Then, liquid crystal is poured in for every block from the above-mentioned liquid crystal inlet. At this time, the liquid crystal with which the desired direction of torsion is acquired according to the orientation processing state of each block is chosen and poured in. By this approach, since each block needs to offer the liquid crystal inlet, respectively, each block must face the periphery section of a liquid crystal panel fundamentally.

[0083] Therefore, as shown in drawing 13 , when there are few blocks, it can constitute, but if the number of blocks increases, manufacture will become difficult or impossible. For this reason, in order to change the direction of clear vision, without changing the direction of torsion of liquid crystal, as shown in drawing 10 , it is desirable to use the approach of changing the direction of rubbing of the both sides of the active-matrix substrates 11 and 12.

[0084] Moreover, even if rubbing processing of Blocks 10A and 10B is not the approach shown in drawing 8 and drawing 10 as mentioned above, it can also be carried out by the approach shown in drawing 7 or drawing 9 . At this time, the direction of clear vision symmetrical with a line should just be set up to symmetry-axis 10X when carrying out mirroring. Especially, with this operation gestalt, since it has wiring structure on the active-matrix substrate 11, when performing rubbing processing as orientation processing, poor rubbing resulting from the thickness of the wiring section can be reduced by performing rubbing processing which met wiring.

[0085] As an orientation art, various orientation arts, such as not only the 1st above-mentioned orientation art (rubbing processing) but the 2nd above-mentioned orientation art (ion irradiation method) and the 3rd orientation art (UV irradiation method), can be used as mentioned above further again. In forming two or more blocks especially, also in order to raise the ease of manufacture, and to raise the grace of orientation processing or to reduce the bad influence to liquid crystal, it is desirable that it is orientation processing by the beam

exposure of light, an electron ray, an ionic line, etc.
[0086] When using the 2nd and 3rd orientation arts, it is desirable to carry out sequential operation for two or more blocks of every which forms, bundles up and processes a mask so that 1 or two or more blocks which are processed in the same direction of orientation may be processed collectively, and processes this processing in the different direction of orientation.
[0087] Drawing 14 is drawing which shows the modification of the above-mentioned operation gestalt and explains typically the direction of clear vision of the effective viewing area of a liquid crystal panel. In addition to axis-of-symmetry 10X, effective viewing-area 10a is equipped with every two a total of four blocks 10C, 10D, 10E, and 10F to the up-and-down axis of symmetry. In this case, like illustration, while Blocks 10C and 10D are arranged in the location which serves as axial symmetry to symmetry-axis 10X, it consists of flat-surface patterns used as axial symmetry, and the direction of clear vision of block 10C and the direction of clear vision of block 10D are further set up mutually in the direction symmetrical with a line on both sides of symmetry-axis 10X. Moreover, while Blocks 10E and 10F are arranged in the location which serves as axial symmetry to symmetry-axis 10X, it consists of flat-surface patterns used as axial symmetry, and the direction of clear vision of block 10E and the direction of clear vision of block 10F are further set up in the direction symmetrical with a line on both sides of symmetry-axis 10X. Since the direction of clear vision will not change to the case of not being reversed at all even if not only mirroring but an image carries out vertical reversal by having such a configuration, the color nonuniformity resulting from the directions over the image of the direction of clear vision differing etc. can be reduced.
[0088] Other modifications are shown similarly [drawing 15] and four blocks 10G, 10H, 10I, and 10J are divided like what is shown in drawing 14 . Although each block is equipped with the different direction of clear vision from what is shown in drawing 14 , the point that the direction of clear vision is constituted by axial symmetry to axis-of-symmetry 10X at arrangement of a block on either side and a flat-surface pattern list is completely the same.
[0089] The case where the inside of effective viewing-area 10a is subdivided further is shown in drawing 16 . In this modification, 12 total of 24 blocks 10k (k= 1, 2, .., 24) is arranged by each both sides of axis-of-symmetry 10X, respectively, and that array structure (arrangement and flat-surface pattern) and the direction of clear vision of each block are constituted so that it may become axial symmetry (mirroring) right and left to both axis-of-symmetry 10X.
[0090] With reference to the [2nd operation gestalt], next drawing 17 , the 2nd operation gestalt of the liquid crystal panel concerning this invention is explained. With this operation gestalt, the inside of effective viewing-area 10a is divided into 12 total of 24 blocks 10n (n= 1, 2, .., 24) at each both sides of axis-of-symmetry 10X, respectively. The block 10n array condition is constituted by axial symmetry at the both sides of symmetry-axis 10X.
[0091] With this operation gestalt, the each block 10n direction of clear vision is distributed over random in right and left of symmetry-axis 10X instead of axial symmetry to symmetry-axis 10X, respectively like the above-mentioned 1st operation gestalt. Here, each block is equipped with the different direction of clear vision to an adjoining block. Therefore, where mirroring of the image formed with one liquid crystal panel among each liquid crystal panel using two or more of these liquid crystal panels 10 as a projection mold display is carried out to the image formed with other liquid crystal panels, when compounding, distribution of the direction of clear vision is not completely in agreement with both images. Since two or more block 10n on both sides of axis-of-symmetry 10X is prepared and each direction of clear vision is formed at random, generating of the color nonuniformity of the synthetic image at the time of compounding an image is controlled, and stops however, being conspicuous. The color nonuniformity of a synthetic image can fully be reduced by forming many block 10n numbers especially. If it divides into at least 24 or more blocks even if it is the case where distribution of the direction of clear vision is not in agreement as mentioned above with one image and the image which carried out mirroring, generating of color nonuniformity can be suppressed.
[0092] The [3rd operation gestalt], next the 3rd operation gestalt of the liquid crystal panel applied to this invention with reference to drawing 18 are explained. With this operation gestalt, two or more block 10m (m= 1, 2, .., 32) is formed in effective viewing-area 10a. With this operation gestalt, block 10m is not arranged at axial symmetry at the both sides of symmetry-axis 10X. Moreover, axis-of-symmetry 10X has not agreed on the block 10m boundary, either. That is, the block arranged so that axis-of-symmetry 10X may be straddled exists. Furthermore, the each block 10m direction of clear vision is not set as axial symmetry to symmetry-axis 10X,

but is carrying out orientation to random on both sides of symmetry-axis 10X, respectively. The block which adjoins also with this operation gestalt is equipped with the mutually different direction of clear vision.
[0093] Thus, even when constituted, the color nonuniformity of the synthetic image which compounded the image component formed with each liquid crystal panel 10 can fully be reduced by making [many] a block 10m number.
[0094]
[Effect of the Invention] According to this invention, as explained above, since orientation processing states will differ and the directions of clear vision will differ mutually for every block within an effective viewing area, the direction of clear vision bias-comes to form the block which consists of two or more pixels in an effective viewing area, and to be hard of each block in the specific direction as the whole liquid crystal panel. Therefore, even if it carries out mirroring of the image formed with the liquid crystal panel concerned, the effect on the image quality resulting from change of the direction of clear vision decreases. Moreover, when compounding the image component formed with two or more liquid crystal panels and forming a synthetic image, where mirroring is carried out, even if between each image component is compounded, the color nonuniformity resulting from a difference of the direction of clear vision etc. can be reduced.

[Translation done.]

* NOTICES *

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TECHNICAL FIELD

[Field of the Invention] This invention relates to a projection mold display at a liquid crystal panel and its manufacture approach list, and especially, when using for the projection mold display constituted so that two or more image components might be formed using two or more liquid crystal panels, the image component of these plurality might be compounded and it might project as a desired image, for example, a color picture, it relates to the configuration of a suitable liquid crystal panel.

[Translation done.]

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PRIOR ART

[Description of the Prior Art] In the projection mold indicating equipment, for example, a liquid crystal projector, using the liquid crystal panel as a light valve, generally, an image component is formed in a respectively different liquid crystal panel for every color through red, blue, and a green light in three primary colors, these image components are compounded, and a desired color picture is made, and it consists of the former so that it may project ahead.
[0003] When compounding the image component of the three above-mentioned color, a cubic-like dichroic prism is used. By carrying out contiguity arrangement of every one liquid crystal panel at two side faces and the front, respectively, and irradiating the light of three colors among the 4th page of the peripheries of a dichroic prism, at three liquid crystal panels, respectively There are some which are constituted so that a synthetic image may be made to inject from the tooth back of a dichroic prism by introducing the image component of two of three colors from the side face of a dichroic prism, reflecting it alternatively, and making the image component of the one remaining colors introduce and penetrate from a transverse plane.
[0004] As a liquid crystal panel used for the above-mentioned liquid crystal projector, the active-matrix panel of TN mold is common. This liquid crystal panel pours in the liquid crystal layer of TN mold between two transparence substrates, arranges two polarizing plates which made the outside of a transparence substrate, and the light transmission shaft cross at right angles mutually, and by [in which it was formed in the shape of a matrix] impressing electric field for every pixel, it is constituted so that a light transmission condition may be changed. Active components, such as a TFT (thin film transistor) component and an MIM (metal-insulator -) component, are formed in one side of a transparence substrate, and a desired video signal can be alternatively impressed now for every pixel electrode.
[0005] The outline configuration of the liquid crystal equipment (liquid crystal panel module) used for the liquid crystal projector using such a conventional liquid crystal panel is explained using drawing 19 . The outline configuration of the liquid crystal panel 10 is carried out from the active-matrix substrate 11 with which a thin film transistor (TFT is called hereafter), the data line, the scanning line, a capacity line, etc. for a transparent pixel electrode, the orientation film, and pixel switching were formed, the opposite substrate 12 with which a transparent counterelectrode and the orientation film were formed, and the liquid crystal layer 13 which is poured into effective viewing-area 10a between these substrates 11 and 12, and is pinched. The liquid crystal in TN (Twisted Nematic) mode which twisted and carried out orientation to 90 degrees between substrates as liquid crystal poured in here with the orientation film on the inside of the active-matrix substrate 11 and the opposite substrate 12 is used widely. Thus, in the active-matrix substrate 11, the orientation condition in the liquid crystal layer 13 is controllable by the constituted liquid crystal panel 10 between a pixel electrode and a counterelectrode with the picture signal impressed to the pixel electrode from the data line through TFT. The part of the liquid crystal layer 13 which a pixel electrode and a counterelectrode counter can control now the optical condition separately realized independently with liquid crystal as a pixel field. In addition, on the inside of the opposite substrate 12, light-shielding film 12a for dividing the effective viewing area and non-display field where the above-mentioned pixel field was arranged is formed.
[0006] On the external surface of the active-matrix substrate 11 of a liquid crystal panel 10, and the opposite substrate 12, face bonding is carried out by the transparence adhesives which the opposite substrate 12 which consists of glass etc. does not illustrate. These opposite substrates 12 are formed in order to prevent that the image quality of the image formed with a liquid crystal panel 10 deteriorates, if a blemish is attached on the external surface of the active-matrix substrate 11 and the opposite substrate 12 or dust has adhered. It can prevent that the blemish on the external surface of the active-matrix substrate 11 and the opposite substrate 12 is

hidden optically, and dust adheres on the external surface of the active-matrix substrate 11 and the opposite substrate 12 with the opposite substrate 12 by which face bonding was carried out through transparence adhesives. Although a blemish may be formed also on the external surface of the opposite substrate 12 or dust may adhere, since distance has separated these external surface from the liquid crystal layer 13, the effect of the blemish on these external surface or the image on dust is reduced according to the defocusing effectiveness.
[0007] The panel assembly which becomes the above-mentioned active-matrix substrate 11 and the opposite substrate 12, and a list from the transparence substrates 1 and 2 is held in the interior of the case object 20 which has protection-from-light nature where adhesives are applied, and adhesion immobilization is carried out by stiffening adhesives in the condition of having equipped with the holder 24, by making it engage with the engagement section 23 of a case object.
[0008] To the above-mentioned liquid crystal panel module, the light emitted from the light source in a projection mold display is irradiated through a condensing system. Here, incidence of the incident light I of illustration is carried out to the transparence substrate 2 from the direction which intersects perpendicularly to the liquid crystal layer 13. Incident light I penetrates the transparence substrate 2 and the opposite substrate 12, and receives predetermined light modulation in the liquid crystal layer 13, it penetrates the active-matrix substrate 11 and the transparence substrate 1, and outgoing radiation is carried out.

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EFFECT OF THE INVENTION

[Effect of the Invention] According to this invention, as explained above, since orientation processing states will differ and the directions of clear vision will differ mutually for every block within an effective viewing area, the direction of clear vision bias-comes to form the block which consists of two or more pixels in an effective viewing area, and to be hard of each block in the specific direction as the whole liquid crystal panel. Therefore, even if it carries out mirroring of the image formed with the liquid crystal panel concerned, the effect on the image quality resulting from change of the direction of clear vision decreases. Moreover, when compounding the image component formed with two or more liquid crystal panels and forming a synthetic image, where mirroring is carried out, even if between each image component is compounded, the color nonuniformity resulting from a difference of the direction of clear vision etc. can be reduced.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Thus, in the constituted liquid crystal panel 10, as shown in drawing 20 which drew the orientation condition of liquid crystal typically, liquid crystal 13LC is in the condition of having twisted and carried out orientation to 90 degrees between the active-matrix substrate 11 and the opposite substrate 12. In order to give such a 90-degree twist to liquid crystal 13LC, after forming the polyimide film used as the orientation film etc. in the front face of the active-matrix substrate 11 and the opposite substrate 12, as an arrow head A and an arrow head B show each direction of rubbing, after performing rubbing processing in the direction which makes the right angle of each other between the substrates of a pair, respectively, lamination and its clearance are filled up with liquid crystal 13LC for the active-matrix substrate 11 and the opposite substrate 12. Consequently, liquid crystal 13LC turns and carries out orientation of the direction of a major axis in the direction of rubbing to the orientation film, and the 90 degrees of the directions of a major axis of liquid crystal 13LC are twisted between the substrate 11 of a pair, and 12. Here, in drawing 20 , in the direction A of orientation of the active-matrix substrate 11, it is in the positive direction of a Y-axis about the direction B of orientation of the opposite substrate 12, and is in the negative direction of the X-axis for the negative direction of the Z-axis about the direction of incidence of incident light I.
[0010] Thus, it is twisted and a contrast property shows directivity according to the orientation condition (bearing of a major axis, and inclination of a major axis) of a substrate 11 and liquid crystal 13LCC located in the center between 12 in the liquid crystal panel 10 using liquid crystal 13LC which carried out orientation. Namely, if bearing at the time of projecting the major axis of liquid crystal 13LCC on a panel side is made into a direction parallel to L shaft and the bearing concerned and bearing which intersects perpendicularly are made into a direction parallel to S shaft when carrying out orientation of the liquid crystal 13LC, as shown in drawing 20 , L shaft and S shaft will become in the direction which has the include angle of 45 degrees on XY flat surface to about X shafts and a Y-axis. In this case, the contrast property at the time of seeing from the direction included in the flat surface (it is called SZ flat surface.) containing S shaft and the Z-axis turns into a symmetrical property to the Z-axis, as shown in drawing 21 . Here, the viewing angle phi is the include angle of the direction of a look included in the above-mentioned SZ flat surface over the Z-axis as shown in drawing 23 . On the other hand, as the contrast property at the time of seeing from the direction included in the flat surface (it is called LZ flat surface.) containing L shaft and the Z-axis is shown in drawing 22 , if there is a peak of contrast in bearing which shifted from Z shaft orientations to the forward side of L shaft a little and it separates, contrast will fall sharply. For example, in the negative side of L shaft, contrast falls remarkably. When such, the direction of the forward side of L shaft is called direction of clear vision, and an opposite direction is called with it direction of reverse clear vision. Here, the viewing angle theta is the include angle of the direction of a look seen from the direction included at the above-mentioned LZ flat surface over the Z-axis as shown in drawing 23 . Moreover, the clear vision include angle theta 0 is the value of the viewing angle theta from which the peak of a contrast ratio is acquired, and although it changes with a property, an inclination, etc. of a liquid crystal molecule in a liquid crystal panel, it is usually about 2 - 8 times.
[0011] By the way, in the above-mentioned liquid crystal projector, the image component reflected among each image component modulated with the liquid crystal panel by the selective reflection side in a dichroic prism and the image component which penetrates a dichroic prism are compounded, where mirroring is carried out mutually. In a liquid crystal projector, the image component which carried out mirroring of the panel for green to the object for red and the panel for blue is compounded with a dichroic prism among red, blue, and the image component of each panel for green. Two or more liquid crystal panels installed in a liquid crystal projector at this time have the trouble that color nonuniformity may occur to the subject-copy image which it is going to

reproduce, when the bearing dependency existed in the optical property of a liquid crystal panel and the image component of a different color by which mirroring was carried out mutually is compounded, since the same thing was usually used mutually.

[0012] Usually, it sets to projection mold displays, such as a liquid crystal projector. Unlike the case of a common liquid crystal display panel, the viewing-angle dependency itself hardly affects a playback image for the reason of the viewing-angle range where visibility is good being limited, but a liquid crystal panel It also has the property that contrast and brightness change, with not the angle of visibility itself but the bearing dependency of an optical property, i.e., the azimuth of a look, and field internal division cloth peculiar to the contrast and brightness of an image component is generated with this bearing dependency. For example, when the above-mentioned direction of clear vision which becomes settled according to the direction of rubbing and the direction of torsion of a liquid crystal molecule exists in a TN liquid crystal and it sees from clear vision, in the field where an angle of visibility is low, contrast increases rather than the direction of a normal over a liquid crystal panel not to mention other directions. When this direction of clear vision is especially shifted from the direction of the symmetry axis of mirroring of an image component, in order that the direction which corresponds in the direction of clear vision in an image component by mirroring may be reversed, it becomes the cause of the color nonuniformity in a synthetic image.

[0013] Then, this invention solves the above-mentioned trouble and the technical problem is in offering the structure of the possible liquid crystal panel of reducing the color nonuniformity produced by the contrast in two or more image components hung down even if it originates in the bearing dependency of the optical property of a liquid crystal panel, or dispersion of brightness in a projection mold display.

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MEANS

[Means for Solving the Problem] In order to solve the above-mentioned technical problem the liquid crystal panel of this invention In the liquid crystal panel with which it came to pinch a liquid crystal layer, and two or more pixels were arranged between the substrates of said pair between the substrates of a pair It is characterized by the 2nd block of the thing which consist of the 1st block which it comes to give orientation processing of liquid crystal to the liquid crystal layer side of one [at least] substrate of the substrate of said pair, and consists of two or more pixels of one [said] substrate, and two or more pixels and which the orientation processing directions of liquid crystal differ mutually.

[0015] Since according to this invention orientation conditions differ, the directions of clear vision will differ mutually for every block and the direction of clear vision bias-comes to be hard of two or more blocks in the specific direction as the whole liquid crystal panel, respectively, even if it carries out mirroring of the image formed with the liquid crystal panel concerned, the effect on the image quality resulting from change of the direction of clear vision decreases. When compounding the image component which followed, for example, was formed with two or more liquid crystal panels and forming a synthetic image, where mirroring is carried out, even if between each image component is compounded, the color nonuniformity resulting from a difference of the direction of clear vision etc. can be reduced.

[0016] Moreover, come to pinch a liquid crystal layer between the substrates of a pair, and the liquid crystal panel of this invention is set to the liquid crystal panel which comes to prepare the effective viewing area by which two or more pixels were arranged between the substrates of said pair. It comes to give orientation processing of liquid crystal to one [at least] substrate of the substrate of said pair. In said effective viewing area The 2nd block of the orientation processing directions of liquid crystal differs mutually. it consists of the 1st block which consists of two or more pixels of one [said] substrate, and two or more pixels -- the 1st and said 2nd block While being formed so that it may become axial symmetry to the symmetry axis which carries out abbreviation bisection of said effective viewing area, it is characterized by being constituted so that said the 1st and block [2nd] direction of clear vision which have been arranged at the position of symmetry of the both sides of said symmetry axis may become axial symmetry to said symmetry axis.

[0017] While according to this invention two or more blocks are formed in an effective viewing area, and being formed so that two or more blocks may become axial symmetry to the symmetry axis which carries out abbreviation bisection of the effective viewing area By being constituted so that the direction of clear vision of said blocks arranged at the position of symmetry of the both sides of said axis of symmetry may become axial symmetry to said axis of symmetry Since the effect on the image quality resulting from change of the direction of clear vision is almost lost even if it carries out mirroring of the image formed with the liquid crystal panel concerned When compounding the image component formed with two or more liquid crystal panels and forming a synthetic image, where mirroring is carried out, even if between each image component is compounded, the color nonuniformity resulting from a difference of the direction of clear vision etc. can be reduced.

[0018] Here, not only the direction of clear vision but the array condition of a block may not be axial symmetry to a symmetry axis. Moreover, it may be constituted so that the block arranged as straddled the axis of symmetry may be included.

[0019] As for the 1st and said 2nd block, in each above-mentioned invention, it is desirable to be formed by changing partially the orientation processing conditions over the front face which attends said liquid crystal layer of one [said] substrate.

[0020] Since the orientation condition of a liquid crystal molecule is controllable by changing partially the

orientation processing conditions on the front face of a substrate according to this invention, the block with which two or more directions of clear vision differ can be formed without changing the structure of the conventional liquid crystal panel.

[0021] Moreover, come to pinch a liquid crystal layer between the substrates of a pair, and the liquid crystal panel of this invention is set to the liquid crystal panel which comes to prepare the effective viewing area by which two or more pixels were arranged between the substrates of said pair. It comes to give orientation processing of liquid crystal to one [at least] substrate of the substrate of said pair. While said effective viewing area has four blocks constituted by dividing into axial symmetry to an up-and-down symmetry axis and a symmetry axis on either side, respectively and the directions of clear vision of said four blocks differ mutually, it is characterized by being constituted so that it may become axial symmetry to said symmetry axis.

[0022] Since according to this invention the direction of clear vision of an effective viewing area is constituted to the symmetry axis of both right and left and the upper and lower sides so that it may become axial symmetry Since the effect on the image quality to which an image originates in change of the direction of clear vision also to mirroring of not only the case of mirroring to right and left but the upper and lower sides is almost lost When compounding the image component formed with two or more liquid crystal panels and forming a synthetic image, where mirroring is carried out, even if between each image component is compounded, the color nonuniformity resulting from a difference of the direction of clear vision can be reduced.

[0023] Moreover, come to pinch a liquid crystal layer between the substrates of a pair, and the liquid crystal panel of this invention is set to the liquid crystal panel which comes to prepare the effective viewing area by which two or more pixels were arranged between the substrates of said pair. While, as for said two or more blocks, the orientation processing directions of liquid crystal differ by coming to give orientation processing of liquid crystal to one [at least] substrate of the substrate of said pair, and said effective viewing area having two or more blocks which consist of two or more pixels The direction of clear vision of a block of said plurality is characterized by not being axial symmetry to the symmetry axis of said effective viewing area.

[0024] In the number of blocks, though each direction of clear vision of two or more blocks was formed in the random instead of axial symmetry to the axis of symmetry of an effective viewing area according to this invention, if, for example it is 24 or more pieces, generating of the color nonuniformity of a synthetic image will be controlled and will not be conspicuous.

[0025] Next, as the manufacture approach of a liquid crystal panel, come to pinch a liquid crystal layer between the substrates of a pair, and it sets to the manufacture approach of a liquid crystal panel of coming to prepare the effective viewing area by which two or more pixels were arranged between the substrates of said pair. Orientation processing is performed on the orientation processing conditions predetermined to the 1st block which consist of two or more pixels to the front face which attends said liquid crystal layer of one [at least] substrate of the substrate of said pair. It is characterized by performing orientation processing to the 2nd block which consists of two or more pixels on predetermined orientation processing conditions which are different in the 1st block, sticking the substrate of said pair on after an appropriate time, pouring in liquid crystal between them, and forming said liquid crystal layer.

[0026] Since according to this invention two or more blocks are formed in an effective viewing area, orientation conditions differ for every block and the directions of clear vision will differ mutually for every block within an effective viewing area, the direction of clear vision bias-comes to be hard in the specific direction as the whole liquid crystal panel. Therefore, even if it carries out mirroring of the image formed with the liquid crystal panel concerned, the effect on the image quality resulting from change of the direction of clear vision decreases. Therefore, when compounding the image component formed with two or more liquid crystal panels and forming a synthetic image, where mirroring is carried out, even if between each image component is compounded, the color nonuniformity resulting from a difference of the direction of clear vision etc. can be reduced. Moreover, two or more blocks equipped with the different direction of clear vision can be formed, without having a complicated process, in order for what is necessary just to be to change orientation processing conditions partially.

[0027] In this invention, while being formed so that it may become axial symmetry to the symmetry axis with which the 1st and said 2nd block carry out abbreviation bisection of said effective viewing area, it is characterized by performing orientation processing so that said direction of clear vision (the 1st block and the 2nd block) arranged at the position of symmetry of the both sides of said symmetry axis may become axial symmetry to said symmetry axis.

[0028] While according to this invention two or more blocks are formed in an effective viewing area, and being formed so that two or more blocks may become axial symmetry to the symmetry axis which carries out abbreviation bisection of the effective viewing area By being constituted so that the direction of clear vision of said blocks arranged at the position of symmetry of the both sides of said axis of symmetry may become axial symmetry to said axis of symmetry Since the effect on the image quality resulting from change of the direction of clear vision is almost lost even if it carries out mirroring of the image formed with the liquid crystal panel concerned When compounding the image component formed with two or more liquid crystal panels and forming a synthetic image, where mirroring is carried out, even if between each image component is compounded, the color nonuniformity resulting from a difference of the direction of clear vision etc. can be reduced.
[0029] It is made for this invention to differ from the direction of torsion of said liquid crystal mutually in the 1st block and said 2nd block in the orientation processing direction of one [said] substrate, and is characterized by making the orientation processing direction over the substrate of another side of the substrate of said pair into said the 1st and direction where the 2nd block is the same.
[0030] Since the direction of orientation of the substrate of another side can be carried out in common, it becomes unnecessary to perform orientation processing for every block about the substrate concerned according to this configuration.
[0031] In this invention, liquid crystal common to the 1st and said 2nd block is poured in, and it is characterized by changing said the 1st and orientation condition of block [2nd] liquid crystal by changing the orientation processing direction over one [said / said] substrate (the 1st block and the 2nd block).
[0032] According to this configuration, since liquid crystal common between the substrates of a pair can be poured in, it is not necessary to prepare two or more inlets of liquid crystal, and two or more blocks can be easily formed according to the usual liquid crystal panel structure.
[0033] In each above-mentioned invention, it is desirable to perform orientation processing by beam exposure to the orientation film formed on the front face which attends said liquid crystal layer of one [said] substrate.
[0034] By irradiating beams, such as light, an electron ray, and ion, at the orientation film, by performing orientation processing, two or more blocks can be formed easily and, according to this invention, moreover, degradation of display grace can be controlled. Since there is no wrap need at a resist etc., a complicated process is not needed.
[0035] As for said beam exposure, in this invention, it is desirable that it is an ion beam exposure.
[0036] According to this configuration, compared with other beam exposures, since it is easy to control a beam exposure location and an exposure, a good orientation condition is acquired, and an ion beam exposure can stop poor orientation. Moreover, in this invention, it is desirable by irradiating said ion beam aslant on the front face of one [said] substrate, and changing exposure bearing of said ion beam partially to control the direction of liquid crystal orientation of said block.
[0037] Since the direction of orientation is changeable only by changing the direction of a substrate, or the sense of a beam exposure according to this configuration, orientation processing of a predetermined direction can be performed without having a complicated production process. Moreover, in each above-mentioned invention, the liquid crystal orientation processing direction of said block may be controlled by performing said beam exposure using the mask which covers the front face of said substrate partially.
[0038] Since according to this configuration it can process by package even if the block of the same orientation processing direction exists ranging over two or more places, the processing time can be shortened.
[0039] In addition, it is desirable to perform orientation processing which met in the wiring direction according to the direction of wiring which used the active-matrix substrate in an active matrix liquid crystal panel as the substrate of the method of top Norikazu especially in this case, and was formed on the active-matrix substrate.
[0040] Furthermore, in each above-mentioned invention, said pixel arranged in the shape of a matrix, the switching element formed for every pixel, and the data line and the scanning line with which this switching element is intersected for supplying potential may be formed, and the orientation condition of the liquid crystal of said block may be changed by performing orientation processing of said block in the direction which met this data line or the scanning line.
[0041] According to this invention, two or more blocks can be formed in the direction which met the crossing data line or the scanning line by performing orientation processing, but since the direction of orientation processing is set up in the direction which met the data line or the scanning line, when performing rubbing

processing especially as an orientation art, the defect of the orientation processing by the level difference on the front face of a substrate formed of the wiring layer of the data line or the scanning line can be reduced.
[0042] It has two or more liquid crystal panels concerning each above-mentioned invention, it is constituted so that the synthetic image which comes to compound two or more image components by which light modulation was carried out with each liquid crystal panel may project, and said image component of at least 1 is the projection mold display characterized to other image components of said by to be constituted so that it may be compounded, where mirroring of the direction of clear vision of said liquid crystal panel is carried out to said symmetry axis extended in the different direction.
[0043] Since according to this invention two or more blocks are formed in a liquid crystal panel, and it has the direction of clear vision which is mutually different in that adjoining field section, or the direction of clear vision is formed in axial symmetry to the symmetry axis and the effect to the image which originates in the direction of clear vision can be reduced even if mirroring of the image formed with the liquid crystal panel is carried out, the color nonuniformity of a synthetic image can be reduced and a high-definition synthetic image can be obtained.
[0044]
[Embodiment of the Invention] Next, the operation gestalt which starts this invention with reference to an accompanying drawing is explained.
[0045] The whole projection mold display configuration in this operation gestalt is explained to the [projection mold display whole configuration] beginning. Drawing 1 shows the structure of the optical system of a projection mold display. As shown in drawing 1 , the projection mold indicating equipment 1100 prepares three liquid crystal display modules which are liquid crystal equipment containing the liquid crystal panel 10 mentioned above, and is constituted as a projector respectively used as light valves 100R, 100G, and 100B for R (red) G(green) B (blue). In a liquid crystal projector 1100, if incident light is emitted from the lamp unit 1102 of sources of the white light, such as a metal halide lamp, it will be divided into parts for Mitsunari R, G, and B corresponding to the three primary colors of RGB with the mirror 1106 of three sheets, and the dichroic mirror 1108 of two sheets, and will be respectively led to the light valves 100R, 100G, and 100B corresponding to each color. Under the present circumstances, especially B light is drawn through the relay lens system 1121 which consists of the incidence lens 1122, a relay lens 1123, and an outgoing radiation lens 1124, in order to prevent the optical loss by the long optical path. And after a part for Mitsunari corresponding to the three primary colors respectively modulated with light valves 100R, 100G, and 100B is again compounded with a dichroic prism 1112, it is projected on it by the screen 1120 as a color picture through a projector lens 1114.
[0046] In such a liquid crystal projector 20, although the image component formed with the liquid crystal light valves 100R and 100B among each image component by which modulation formation was carried out with each liquid crystal light valves 100R, 100G, and 100B is reflected in the alternative reflector in a dichroic prism 1112 when it is what drawing 1 displays the cross section of equipment as, the image component formed of liquid crystal light valve 100G penetrates a dichroic prism 1112 as it is, without being reflected. Therefore, the image component formed based on the flux of lights R and B and the image component formed based on the flux of light G will be compounded by the longitudinal direction where mirroring is mutually carried out as a symmetry axis, and vertical axes will be ahead projected on it.
[0047] As shown in drawing 2 and drawing 3 , the liquid crystal panel 10 which constitutes the [structure of liquid crystal panel] above-mentioned liquid crystal light valves 100R, 100G, and 100B pours in liquid crystal 13 into liquid crystal impregnation field 10a which was stuck so that the active-matrix substrate 11 and the opposite substrate 12 which consist of glass etc. might have a predetermined gap (cel gap) through a sealant 14, and was constituted inside the sealant 14, and is constituted. Liquid crystal 13 is poured in from liquid crystal inlet 14a prepared in the sealant 14, and liquid crystal inlet 14a is blocked by the encapsulant 15 which consists of resin etc. after that. As a sealant 14, an epoxy resin and various kinds of photo-setting resins can be used. In order to secure a cel gap, the fiber of inorganic [which was equipped with the particle size (about 2-10 micrometers) equivalent to a cel gap in the sealant 14] or the quality of organic or a solid sphere is mixed.
[0048] The active-matrix substrate 11 is equipped with big surface area a little rather than the opposite substrate 12, and active components, such as wiring layers, such as the data line and the scanning line, a transparent electrode, and TFT (thin film transistor), are formed in the inside corresponding to many pixels. The transparent electrode corresponding to a pixel is formed also in the inside of the opposite substrate 12. Light-shielding film 12a formed in the shape of the circumference in the inside of the formation field of a sealant 14 is formed in the

outside of the field corresponding to a pixel of the inside of the opposite substrate 12.
[0049] Circuit pattern 11a connected conductively to the wiring layer formed on the inside of the active-matrix substrate 11 and the opposite substrate 12 is formed in the outside of the formation field of the sealant 14 on the inside of the active-matrix substrate 11, and the scanning-line drive circuit 17 and the data-line drive circuit 18 are formed according to this circuit pattern 11a. Furthermore, external terminal area 11b to which many external terminals 19 arranged the rim section by the side of one of the active-matrix substrate 11 is constituted, and wiring members, such as the flexible wiring substrate 16, are connected conductively through the anisotropy electric conduction film etc. to this external terminal area 11b.
[0050] What suited the liquid crystal panel in the various modes, such as IPS (inch-plain switching) mode besides TN mold and a STN mold and VA (vertically aligned) mode, can be used for liquid crystal 13. With the above-mentioned liquid crystal panel 10, it is attached according to the class of liquid crystal 13 to be used, a mode of operation, a display mode (Nor Marie White, Nor Marie Black), etc. with the posture which turned the polarization film, the phase contrast film, the polarizing plate, etc. to predetermined bearing.
[0051] The representative circuit schematic on the active-matrix substrate 11 (component substrate) in the case of constituting the liquid crystal panel of the active-matrix mold which used TFT is shown, and the plane configuration on the same active-matrix substrate 11 is expanded and shown in drawing 5 , and the cross-section structure cut along with the VI-VI line of drawing 5 is typically shown in drawing 4 at drawing 6 . As shown in drawing 4 , on the active-matrix substrate 11, it is formed so that the scanning line 101 and the data line 103 may stand in a row in all directions, respectively, and the scanning line 101 is connected to the gate of TFT104 formed for every pixel, and the source of TFT104 is connected to the data line 103. The drain of TFT104 is electrically connected also to storage capacitance 105 while connecting with the pixel electrode 106 electrically. Storage capacitance 105 is connected to the capacity line 102. As an approach of forming this storage capacitance 105, you may form between the scanning lines 101 of the preceding paragraph instead of the capacity line 102.
[0052] It is impressed for every group who makes a group two or more data lines which the scan signal Gn is impressed to the scanning line 101 by line sequential in pulse, and a picture signal Sn is impressed to the data line 103 line sequential, or adjoin each other. TFT104 writes the potential according to data signal Sn in the pixel electrode 106 suitably according to the scan signal Gn. The pixel electrode 106 counters the counterelectrode which was formed on the inside of the opposite substrate 12 through the liquid crystal layer which is not illustrated and which is not illustrated, and gives desired electric field to a liquid crystal layer between the counterelectrodes with which predetermined potential is supplied. Drawing 5 shows the top view of a pixel and drawing 6 is the VI-VI sectional view of drawing 5 .
[0053] As shown in drawing 5 and drawing 6 , TFT104 extends to the field shown in drawing 5 with an illustration slash, the source 1041 is connected conductively in opening 1041a to the data line 103, and the gate 1042 counters through the thin insulator layer which intersects the scanning line 101 and is not illustrated. A drain 1043 is connected conductively to the pixel electrode 106 through opening 1043a. The bottom electrode 1040 which extended from such structures laps superficially through the capacity line 102 and an insulating layer, and constitutes the above-mentioned storage capacitance 105. Storage capacitance 105 is for carrying out long duration maintenance of the potential of the pixel electrode 106 to leak of a charge so that it may be well-known.
[0054] [Relation between 1st orientation art, and orientation processing and direction of clear vision] drawing 7 shows the relation between the direction of rubbing over each substrate front face of the active-matrix substrate 11 in the case of forming the active-matrix type liquid crystal panel of the above-mentioned TN mold, and the opposite substrate 12, and the direction of clear vision of the formed liquid crystal panel. In drawing 7 , the condition of having seen the active-matrix substrate 11 and the opposite substrate 12 for the liquid crystal panel 10 in piles from the incidence side is shown. Void Rhine in every direction in drawing shows wiring structure (or array structure of a pixel) typically, in order to show the extended direction of the scanning line and the data line on the active-matrix substrate 11. Supposing void Rhine extended in one direction is the scanning line, void Rhine extended in another direction shows the data line.
[0055] In a general liquid crystal projector, since a projection image is set up oblong, a liquid crystal panel is installed in equipment, where a longitudinal direction is made into a longitudinal direction, as shown in drawing 7 . In the above-mentioned liquid crystal panel 10, the orientation film which consists of polyimide etc. is formed on the inside of the active-matrix substrate 11 and the opposite substrate 12, and rubbing processing is

performed by grinding the front face of this orientation film with cloth etc. But it may go to the front face of the usual insulator layer, without forming the orientation film used only for orientation especially as rubbing processing, inorganic film other than the organic film may be used, or mechanical rubbing processing may be made unnecessary by forming a coat using the slanting vacuum deposition of non-element material etc.
[0056] Usually, the direction of clear vision of a liquid crystal panel serves as the illustration upper part by carrying out rubbing processing by direction of rubbing R (11) turned to the upper left from the illustration lower right to the active-matrix substrate 11, carrying out rubbing processing by direction of rubbing R (12) turned to the lower left from the illustration upper right to the opposite substrate 12, and carrying out the direction of torsion of 90 degrees of liquid crystal in the direction of S of illustration. In the direction of clear vision being determined by the direction of rubbing of the active-matrix substrate 11 and the opposite substrate 12, and the direction of torsion of liquid crystal and performing rubbing processing aslant to the wiring direction like illustration, the direction of clear vision turns into the direction of either of vertical and horizontal.

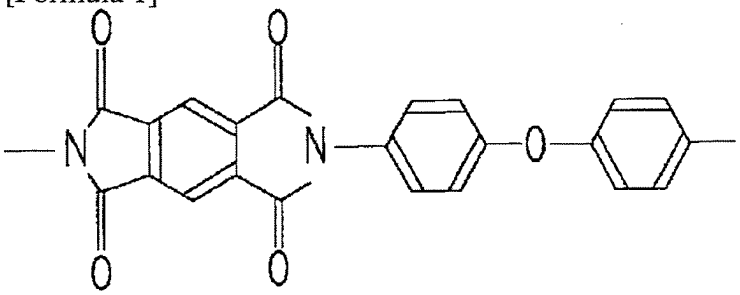
[0057] If the liquid crystal panel whose direction of clear vision is the upper part is installed in the liquid crystal projector 20 shown in drawing 1 with the posture shown in drawing 7 as liquid crystal light valves 100R, 100G, and 100B as shown in drawing 7 Since mirroring of the image component of the flux of lights R and B is only carried out to the longitudinal direction to the image component of the flux of light G among three image components, the direction of clear vision in three image components all serves as the upper part after composition, and the direction of clear vision does not change with image components.
[0058] The direction of clear vision becomes illustration right-hand side by changing the direction of rubbing in the direction which drawing 7 is made to rotate the direction of rubbing of the active-matrix substrate 11 180 degrees as a dotted line shows on the other hand, and is shown by AR (11), and making the direction of torsion of liquid crystal into the direction of AS of illustration. In this case, if the image component of the flux of lights R and B is carrying out mirroring to right and left to the image component of the flux of light G as mentioned above, the direction of clear vision will also become right-and-left reverse, and color nonuniformity will occur in a synthetic image.
[0059] As mentioned above, when making the direction of rubbing slanting (making it incline whenever [45]) to the wiring direction and performing it, the direction of clear vision can be set up up and down, and it is used for the usual liquid crystal display panel etc. as it is. However, it is not desirable, when poor orientation may occur and display quality is raised by existence of the level difference of wiring (scanning line or data line) in this case. Since it is necessary to form high definition pixel structure in a panel area smaller than usual as a liquid crystal panel especially used for projection mold displays, such as a liquid crystal projector, there is a trouble of being easy to generate the poor orientation resulting from a wiring level difference. So, with this operation gestalt, generating of the poor orientation resulting from a wiring level difference is reduced by performing the direction of rubbing along the wiring direction.
[0060] The situation in the case of performing rubbing processing along the wiring direction is shown in drawing 8 . If direction [of the active-matrix substrate 11] of rubbing R (11) is made into the direction which goes upwards from under illustration, direction [of the opposite substrate 12] of rubbing R (12) is made into the direction which goes to the left from the illustration right and the direction of torsion of liquid crystal is carried out in the direction of S, the direction of clear vision will turn into the direction of the upper right like illustration. Thus, if the direction of rubbing is set up in the wiring direction, the direction of clear vision will surely turn into the direction of slanting to the wiring direction. Therefore, if it installs in a liquid crystal projector as a liquid crystal light valve shown in drawing 1 as it is with the posture shown in drawing 8 From being compounded where mirroring of the image component based on the flux of lights R and B and the image component based on the flux of light G is carried out to right and left Color nonuniformity will occur in that in which the direction of clear vision of the color tone component of the flux of lights R and B and the direction of clear vision of the color tone component of the flux of light G carry out right-and-left reversal in a synthetic image (diagonal right and diagonal left). In addition, in the example shown in drawing 8 , if it sets up in the direction AR of rubbing (12) which shows the direction of rubbing of the opposite substrate 12 by the illustration dotted line which is the above-mentioned opposite direction and moreover sets up in the direction of AS which shows the direction of torsion of liquid crystal by the illustration dotted line, as an illustration dotted line shows, the direction of clear vision will turn into the direction of the diagonal left.
[0061] When performing rubbing processing in the direction of slant like drawing 7 , drawing 9 changes the

direction of rubbing of the both sides of the active-matrix substrate 11 and the opposite substrate 12, and considers as the directions AR (11) and AR of rubbing (12), and the direction S of torsion of liquid crystal shows the example in the case of changing the direction of clear vision, without changing. Moreover, when performing rubbing processing in the wiring direction like drawing 8 , drawing 10 changes the direction of rubbing of the both sides of the active-matrix substrates 11 and 12, and considers as the directions AR (11) and AR of rubbing (12), and the direction S of torsion of liquid crystal shows the example in the case of changing the direction of clear vision, without changing.

[0062] [Orientation art of ** 2nd] drawing 11 shows the orientation art using the ion irradiation method as an option from which the orientation art by the above rubbing processings differs. In this approach, first, after forming the necessary surface structures 111, such as wiring, an electrode, and an active component, in the front face of the active-matrix substrate 110, an orientation material is extensively applied on the inside of the active-matrix substrate 110 with a spin coat method etc. As an orientation material, a fusibility type polyimide material, the polyimide material which needs polymerization hardening, a polyamic acid type polyimide material, etc. can be used. A fusibility type polyimide material can perform orientation processing, applied. Other orientation materials are usually stiffened by desiccation or baking.

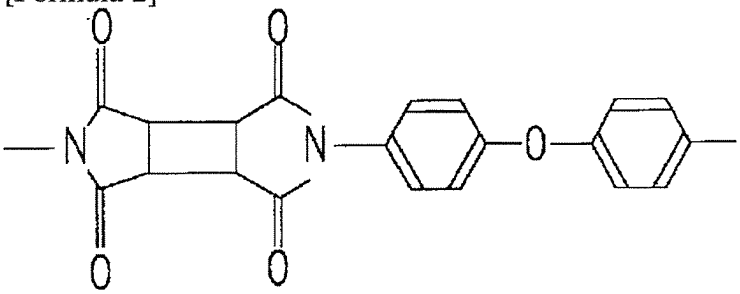
[0063] As a fusibility type polyimide material, it is [0064].

[Formula 1]



[0065]

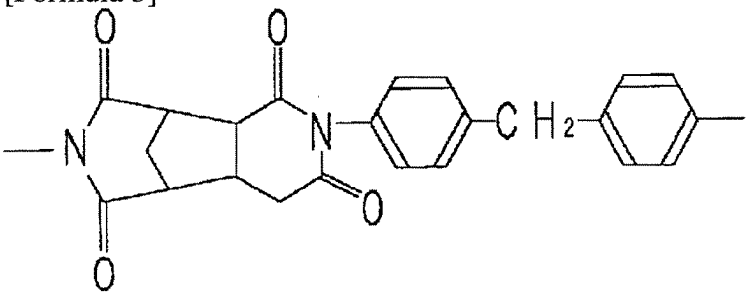
[Formula 2]



[0066] It is suitable especially in order that a thing with which principal chain may realize high electrical-potential-difference retention, uniform liquid crystal orientation, and a high pre tilt angle.

[0067] Moreover, as a polyamic acid type polyimide material, it is [0068].

[Formula 3]



[0069] There is a thing equipped with the structure of ********.

[0070] The active-matrix substrate 110 which formed the orientation film 112 on the front face as mentioned above was introduced in the chamber of ion irradiation equipment. And made the interior of a chamber into the

vacuum, Ar ion was made to emit from the ion source 121, and it accelerated and irradiated with the accelerating electrode 122.
[0071] This ion irradiation is for performing orientation processing to the orientation film 112. The degree of vacuum at this time is 5x10-3torr, an ion irradiation include angle is psi= 45 degrees, and it is acceleration voltage 100 V and current density [of 20micro] A/cm2. Ar ion was irradiated on conditions. Moreover, orientation processing was carried out on this exposure condition, moving the active-matrix substrate 110 in the direction of an illustration arrow head (namely, direction which is a direction parallel (contained) to the panel side of the transparence substrate 10, and goes to bearing in which the ion source 121 inclines to a panel side) by 1cm/second in rate (scan). Of course, the ion source 121 may be scanned instead of the active-matrix substrate 110.
[0072] Since it is dependent on the relation of whenever [ion acceleration voltage, pre tilt angle / of a liquid crystal molecule / and relation / of whenever / orientation order /, illuminating-angle whenever and pre tilt angle, and orientation order], the relation between a degree of vacuum and whenever [orientation order], etc., the orientation condition by ion irradiation acquires these relation as data beforehand, and it is desirable to optimize the conditions of the ion irradiation in orientation processing from these data.
[0073] As ion acceleration voltage, it is high in a pre tilt angle, and in order to make whenever [orientation order] high, it is desirable that it is more than 100V and less than [200V]. Moreover, it is [whenever / pre tilt angle and illuminating-angle / of the viewpoint of whenever / orientation order / to ion] desirable [especially psi] similarly that it is 45-50 degrees 40-50 degrees. Furthermore, the degree of vacuums at the time of ion irradiation are 10-1 - 10-4torr, and it is desirable that the distance L from the ion irradiation opening to the orientation film 112 is moreover 1mm or more 300mm or less.
[0074] It is desirable that it is within the limits whose thickness after orientation processing of the orientation film 112 is 10-100nm especially as a liquid crystal display in order to lessen effect of the voltage drop by the orientation film and to secure sufficient orientation restraining force moreover.
[0075] In performing orientation processing on partially different orientation processing conditions on the front face of the active-matrix substrate 11 so that it may mention later, when carrying out orientation processing by the above-mentioned approach, to the orientation film 112, as shown in drawing 11 (b), the metal mask 113 is set, ion irradiation is performed, and it is made not to perform orientation processing to field 112a covered with the mask 113. Next, to the above-mentioned field 112, psi is set up towards different bearing whenever [illuminating-angle / of an ion beam], and orientation processing is performed where the front face of the orientation film 112 by which orientation processing was already carried out is covered with a mask 113. By doing in this way, the liquid crystal orientation field which carries out orientation of the liquid crystal molecule can be formed in the different direction to the orientation film 112 on the active-matrix substrate 11.
[0076] A further different orientation art is explained with reference to [the 3rd orientation art], next drawing 12 . In order to form division orientation panel structure in a high definition liquid crystal panel so that it may mention later, the rubbing processing performed by contact of a rubbing roller, a buff, etc. has many problems. For this reason, it is desirable to perform optical orientation processing performed by irradiating ultraviolet rays etc. at the orientation film. This optical orientation processing is performed by the approach shown below. First, after applying orientation film ingredients, such as an organic macromolecule, on the front face of the transparence substrate 71, as shown in drawing 12 (a), it calcinates and the orientation film 72 is formed. Then, as shown in drawing 12 (b), the ultraviolet rays 74 which polarized in the direction which arranges the optical mask 73 of a predetermined pattern on the orientation film 72, for example, intersects perpendicularly with space are irradiated almost at right angles to the front face of the transparence substrate 71, and orientation ****** field section (block) 72a which consists of two or more pixels is formed. Next, as shown in drawing 12 (c), using the optical predetermined mask 75 on which the surface part of orientation film 72 which is different in the above-mentioned mask 73 is exposed, ultraviolet rays 76 are irradiated alternatively at the orientation film 72, and orientation processing field section (block) 72b which consists of two or more pixels is formed. These ultraviolet rays 76 polarize in the direction (illustration longitudinal direction) rotated 90 degrees to the polarization direction of the ultraviolet rays 74 shown in drawing 12 (b). Thus, by performing ultraviolet-rays exposure for the processed transparence substrate 71 similarly, by sticking with the opposite substrate 77 which has the orientation film 78 processed so that two or more blocks which performed similarly different orientation processing might be formed, as shown in drawing 12 (d), a liquid crystal panel 70 can be formed. By irradiating the ultraviolet rays which polarized in the specific direction as a material of the orientation film 72 and 78 here,

the orientation film molecule which carried out orientation is disassembled in the specific direction, and what has liquid crystal stacking tendency ability similar to the case where orientation processing (rubbing processing) is carried out (what has an optical stacking tendency) is used in the specific direction and the direction which intersects perpendicularly. The liquid crystal orientation field sections 79a and 79b to which orientation of the liquid crystal molecule was carried out are formed in mutually different bearing by two or more blocks irradiated by the ultraviolet rays of polarization bearing which changes with these properties. Here, as an organic material which has the above optical stacking tendencies, PVCi (Aldrich make), s610 (the Nissan chemistry company make), etc. can be used, for example.

[0077] Based on the [1st operation gestalt], next the above-mentioned explanation, the 1st operation gestalt of the liquid crystal panel concerning this invention is explained. Drawing 13 is the explanatory view showing typically the direction of clear vision of the effective viewing area of the liquid crystal panel of the 1st operation gestalt. With this operation gestalt, Blocks (liquid crystal orientation field section) 10A and 10B are formed at every one both sides of axis-of-symmetry 10X which bisects the effective viewing-area 10a concerned in effective viewing-area 10a which held the liquid crystal pinched by the active-matrix substrate 11 and the opposite substrate 12 as shown in drawing 13 . By changing the conditions of orientation processing mutually, these blocks 10A and 10B are formed so that the orientation conditions of a liquid crystal molecule may differ. Moreover, Blocks 10A and 10B are constituted so that it may become a flat-surface configuration symmetrical with mutual in the both sides of symmetry-axis 10X.

[0078] for example, as an approach of changing the orientation condition of each blocks 10A and 10B When using the 1st above-mentioned orientation art, rubbing processing of direction of rubbing R (11) shown in the active-matrix substrate 11 in block 10A at drawing 8 is performed. Rubbing processing of the direction AR of rubbing (12) shown in the opposite substrate 12 by the dotted line at drawing 8 is carried out, and it constitutes so that a liquid crystal panel may have the direction of clear vision of the method of the illustration diagonal left, as liquid crystal equips drawing 8 with the direction AS of torsion shown by the dotted line. On the other hand, in block 10B, as shown in drawing 8 , rubbing processing of direction of rubbing R (11) is performed to the active-matrix substrate 11, rubbing processing of direction of rubbing R (12) is carried out to the opposite substrate 12, and it constitutes so that a liquid crystal panel may have the direction of clear vision diagonally across to the right of illustration, as liquid crystal is equipped with the direction S of torsion. In this case, in performing rubbing processing to one block, it carries out as a condition which covered the substrate front face of a block of another side with the resist layer etc.

[0079] Consequently, as an illustration arrow head shows Blocks 10A and 10B, that direction of clear vision serves as axial symmetry (mirroring condition) mutually to symmetry-axis 10X. Therefore, two or more liquid crystal panels 10 are used for projection mold indicating equipments, such as an above-mentioned liquid crystal projector, as a light valve. Where mirroring of the image component formed of one of the liquid crystal panels 10 is carried out to the image component formed with other liquid crystal panels, when being compounded, Since the direction of clear vision will not change to the case of not being reversed at all even if an image carries out mirroring with this operation gestalt, the color nonuniformity resulting from the directions over the image of the direction of clear vision differing etc. can be reduced.

[0080] Especially, by the above-mentioned approach, the direction of clear vision is changed by changing the direction of rubbing of the opposite substrate 12 (opposite substrate), and the direction of torsion of liquid crystal, without changing direction [of the active-matrix substrate 11] of rubbing R (11). For this reason, since it is not necessary to set up the direction of orientation which is different on the orientation film to the active-matrix substrate 11, manufacture processing can be made easy.

[0081] In addition, as a continuous line shows, rubbing processing of direction of rubbing R (11) is performed to the active-matrix substrate 11 at drawing 8 . In performing rubbing processing of direction of rubbing R (12) to the opposite substrate 12 The direction of rubbing of the active-matrix substrate 11 is changed into the opposite direction of above-mentioned rubbing direction R (11) to the direction of clear vision of a liquid crystal panel turning into the direction of the illustration upper right. When the direction of torsion of liquid crystal is made into the direction of AS, without changing the direction of rubbing of the opposite substrate 12, the direction of clear vision turns into the direction of the illustration lower right. In this case, by using the liquid crystal panel which has the direction of clear vision of the direction of the illustration upper right, and the liquid crystal panel which has the direction of clear vision of the direction of the illustration lower right, if it is the configuration of a liquid crystal projector in which the relation between two or more image components

carries out mirroring up and down at the time of composition of an image component, the inequality of the direction of clear vision by mirroring is avoidable similarly.

[0082] By the above-mentioned approach, since it is necessary to use the liquid crystal which has the different direction of torsion in Blocks 10A and 10B, it is necessary to also divide and form a liquid crystal layer. Thus, as an approach of carrying out division formation of the liquid crystal layer, there are the following approaches, for example. First, the partition part into which it divides between blocks is formed by the sealant etc. between the active-matrix substrate 11 and the opposite substrate 12, a liquid crystal inlet is prepared for every block, and the active-matrix substrate 11 and the opposite substrate 12 are stuck. Then, liquid crystal is poured in for every block from the above-mentioned liquid crystal inlet. At this time, the liquid crystal with which the desired direction of torsion is acquired according to the orientation processing state of each block is chosen and poured in. By this approach, since each block needs to offer the liquid crystal inlet, respectively, each block must face the periphery section of a liquid crystal panel fundamentally.

[0083] Therefore, as shown in drawing 13 , when there are few blocks, it can constitute, but if the number of blocks increases, manufacture will become difficult or impossible. For this reason, in order to change the direction of clear vision, without changing the direction of torsion of liquid crystal, as shown in drawing 10 , it is desirable to use the approach of changing the direction of rubbing of the both sides of the active-matrix substrates 11 and 12.

[0084] Moreover, even if rubbing processing of Blocks 10A and 10B is not the approach shown in drawing 8 and drawing 10 as mentioned above, it can also be carried out by the approach shown in drawing 7 or drawing 9 . At this time, the direction of clear vision symmetrical with a line should just be set up to symmetry-axis 10X when carrying out mirroring. Especially, with this operation gestalt, since it has wiring structure on the active-matrix substrate 11, when performing rubbing processing as orientation processing, poor rubbing resulting from the thickness of the wiring section can be reduced by performing rubbing processing which met wiring.

[0085] As an orientation art, various orientation arts, such as not only the 1st above-mentioned orientation art (rubbing processing) but the 2nd above-mentioned orientation art (ion irradiation method) and the 3rd orientation art (UV irradiation method), can be used as mentioned above further again. In forming two or more blocks especially, also in order to raise the ease of manufacture, and to raise the grace of orientation processing or to reduce the bad influence to liquid crystal, it is desirable that it is orientation processing by the beam exposure of light, an electron ray, an ionic line, etc.

[0086] When using the 2nd and 3rd orientation arts, it is desirable to carry out sequential operation for two or more blocks of every which forms, bundles up and processes a mask so that 1 or two or more blocks which are processed in the same direction of orientation may be processed collectively, and processes this processing in the different direction of orientation.

[0087] Drawing 14 is drawing which shows the modification of the above-mentioned operation gestalt and explains typically the direction of clear vision of the effective viewing area of a liquid crystal panel. In addition to axis-of-symmetry 10X, effective viewing-area 10a is equipped with every two a total of four blocks 10C, 10D, 10E, and 10F to the up-and-down axis of symmetry. In this case, like illustration, while Blocks 10C and 10D are arranged in the location which serves as axial symmetry to symmetry-axis 10X, it consists of flat-surface patterns used as axial symmetry, and the direction of clear vision of block 10C and the direction of clear vision of block 10D are further set up mutually in the direction symmetrical with a line on both sides of symmetry-axis 10X. Moreover, while Blocks 10E and 10F are arranged in the location which serves as axial symmetry to symmetry-axis 10X, it consists of flat-surface patterns used as axial symmetry, and the direction of clear vision of block 10E and the direction of clear vision of block 10F are further set up in the direction symmetrical with a line on both sides of symmetry-axis 10X. Since the direction of clear vision will not change to the case of not being reversed at all even if not only mirroring but an image carries out vertical reversal by having such a configuration, the color nonuniformity resulting from the directions over the image of the direction of clear vision differing etc. can be reduced.

[0088] Other modifications are shown similarly [drawing 15] and four blocks 10G, 10H, 10I, and 10J are divided like what is shown in drawing 14 . Although each block is equipped with the different direction of clear vision from what is shown in drawing 14 , the point that the direction of clear vision is constituted by axial symmetry to axis-of-symmetry 10X at arrangement of a block on either side and a flat-surface pattern list is completely the same.

[0089] The case where the inside of effective viewing-area 10a is subdivided further is shown in drawing 16 . In

this modification, 12 total of 24 blocks 10k (k= 1, 2, .., 24) is arranged by each both sides of axis-of-symmetry 10X, respectively, and that array structure (arrangement and flat-surface pattern) and the direction of clear vision of each block are constituted so that it may become axial symmetry (mirroring) right and left to both axis-of-symmetry 10X.

[0090] With reference to the [2nd operation gestalt], next drawing 17 , the 2nd operation gestalt of the liquid crystal panel concerning this invention is explained. With this operation gestalt, the inside of effective viewing-area 10a is divided into 12 total of 24 blocks 10n (n= 1, 2, .., 24) at each both sides of axis-of-symmetry 10X, respectively. The block 10n array condition is constituted by axial symmetry at the both sides of symmetry-axis 10X.

[0091] With this operation gestalt, the each block 10n direction of clear vision is distributed over random in right and left of symmetry-axis 10X instead of axial symmetry to symmetry-axis 10X, respectively like the above-mentioned 1st operation gestalt. Here, each block is equipped with the different direction of clear vision to an adjoining block. Therefore, where mirroring of the image formed with one liquid crystal panel among each liquid crystal panel using two or more of these liquid crystal panels 10 as a projection mold display is carried out to the image formed with other liquid crystal panels, when compounding, distribution of the direction of clear vision is not completely in agreement with both images. Since two or more block 10n on both sides of axis-of-symmetry 10X is prepared and each direction of clear vision is formed at random, generating of the color nonuniformity of the synthetic image at the time of compounding an image is controlled, and stops however, being conspicuous. The color nonuniformity of a synthetic image can fully be reduced by forming many block 10n numbers especially. If it divides into at least 24 or more blocks even if it is the case where distribution of the direction of clear vision is not in agreement as mentioned above with one image and the image which carried out mirroring, generating of color nonuniformity can be suppressed.

[0092] The [3rd operation gestalt], next the 3rd operation gestalt of the liquid crystal panel applied to this invention with reference to drawing 18 are explained. With this operation gestalt, two or more block 10m (m= 1, 2, .., 32) is formed in effective viewing-area 10a. With this operation gestalt, block 10m is not arranged at axial symmetry at the both sides of symmetry-axis 10X. Moreover, axis-of-symmetry 10X has not agreed on the block 10m boundary, either. That is, the block arranged so that axis-of-symmetry 10X may be straddled exists. Furthermore, the each block 10m direction of clear vision is not set as axial symmetry to symmetry-axis 10X, but is carrying out orientation to random on both sides of symmetry-axis 10X, respectively. The block which adjoins also with this operation gestalt is equipped with the mutually different direction of clear vision.

[0093] Thus, even when constituted, the color nonuniformity of the synthetic image which compounded the image component formed with each liquid crystal panel 10 can fully be reduced by making [many] a block 10m number.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the outline block diagram showing the structure of the optical system of the liquid crystal projector as an operation gestalt of the projection mold indicating equipment concerning this invention.
[Drawing 2] It is the typical outline top view showing the planar structure of the liquid crystal panel built in this operation gestalt.
[Drawing 3] It is the typical outline sectional view showing the cross-section structure of the liquid crystal panel built in this operation gestalt.
[Drawing 4] It is the representative circuit schematic showing the equal circuit of the surface structure of the active-matrix substrate which constitutes the liquid crystal panel in this operation gestalt.
[Drawing 5] It is the expansion top view showing the planar structure of the surface structure of the active-matrix substrate which constitutes the liquid crystal panel in this operation gestalt.
[Drawing 6] It is the outline expanded sectional view showing the cross section (condition cut along with the VI-VI line of drawing 5) of the surface structure of the active-matrix substrate which constitutes the liquid crystal panel in this operation gestalt.
[Drawing 7] It is the explanatory view showing the relation of the direction of rubbing and the direction of clear vision which were set up in the direction of slant of this liquid crystal panel.
[Drawing 8] It is the explanatory view showing the relation of the direction of rubbing and the direction of clear vision which were set up in the wiring direction of this liquid crystal panel.
[Drawing 9] It is the explanatory view showing how modification of only the direction of rubbing of both the transparence substrate realizes modification of the same direction of clear vision as what is shown in drawing 7 a .
[Drawing 10] It is the explanatory view showing how modification of only the direction of rubbing of both the transparence substrate realizes modification of the same direction of clear vision as what is shown in drawing 8 a .
[Drawing 11] They are the explanatory view (a) showing the orientation art by ion irradiation, and (b).
[Drawing 12] It is process explanatory view (a) - (d) which shows the orientation art by the UV irradiation for forming two or more blocks and blocks.
[Drawing 13] It is the approximate account Fig. showing the configuration of the 1st operation gestalt of the liquid crystal panel concerning this invention.
[Drawing 14] It is the approximate account Fig. showing the configuration of the modification of the 1st operation gestalt of the liquid crystal panel concerning this invention.
[Drawing 15] It is the approximate account Fig. showing the configuration of the modification of the 1st operation gestalt of the liquid crystal panel concerning this invention.
[Drawing 16] It is the approximate account Fig. showing the configuration of the modification of the 1st operation gestalt of the liquid crystal panel concerning this invention.
[Drawing 17] It is the approximate account Fig. showing the configuration of the 2nd operation gestalt of the liquid crystal panel concerning this invention.
[Drawing 18] It is the approximate account Fig. showing the configuration of the 3rd operation gestalt of the liquid crystal panel concerning this invention.
[Drawing 19] It is the outline sectional view showing typically the structure of the liquid crystal panel joule as an example of the liquid crystal equipment containing the conventional liquid crystal panel.
[Drawing 20] It is the explanatory view showing the direction of orientation of the liquid crystal in the liquid

crystal layer in a liquid crystal panel, and the direction of an optical property.
[Drawing 21] It is the graph which shows change of the contrast ratio to the viewing angle phi within SZ flat surface shown in drawing 20 in a liquid crystal panel.
[Drawing 22] It is the graph which shows change of the contrast ratio to the viewing angle theta within LZ flat surface shown in drawing 20 in a liquid crystal panel.
[Drawing 23] It is the explanatory view showing the relation between the viewing angles phi and theta of the outgoing radiation light of a liquid crystal panel, and the direction of clear vision.
[Description of Notations]
10 Liquid Crystal Panel
10a Effective viewing area
10A, 10B, and .. 10J, 10k, 10n, and 10m The liquid crystal orientation field section
11 Active-Matrix Substrate
12 Opposite Substrate
R (11), R (12), AR (11), AR (12) The direction of rubbing
S, AS The direction of torsion of liquid crystal
1100 Liquid Crystal Projector
100R, 100B, 100G Liquid crystal light valve
1112 Prism Unit (Dichroic Prism)

[Translation done.]

* NOTICES *

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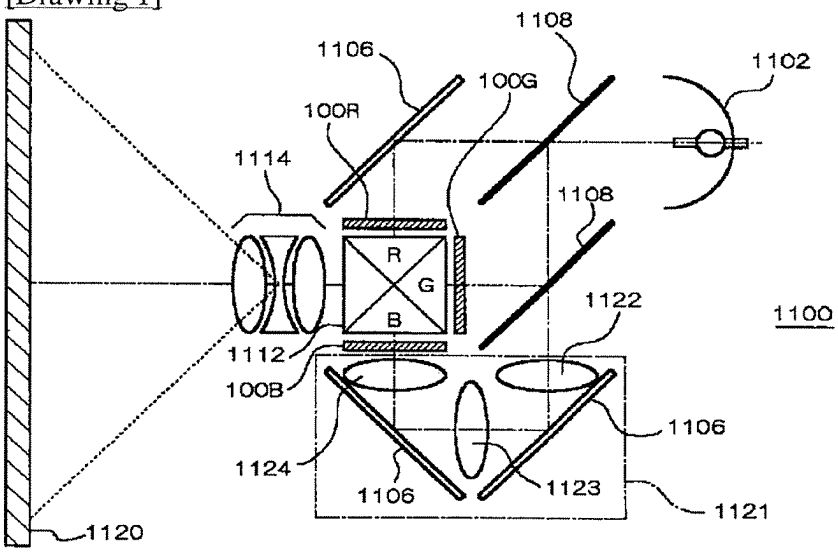
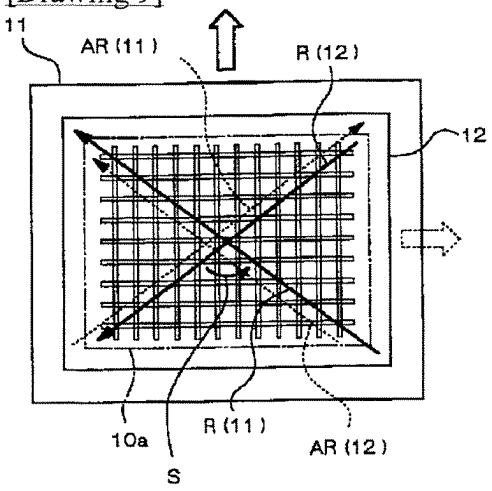
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

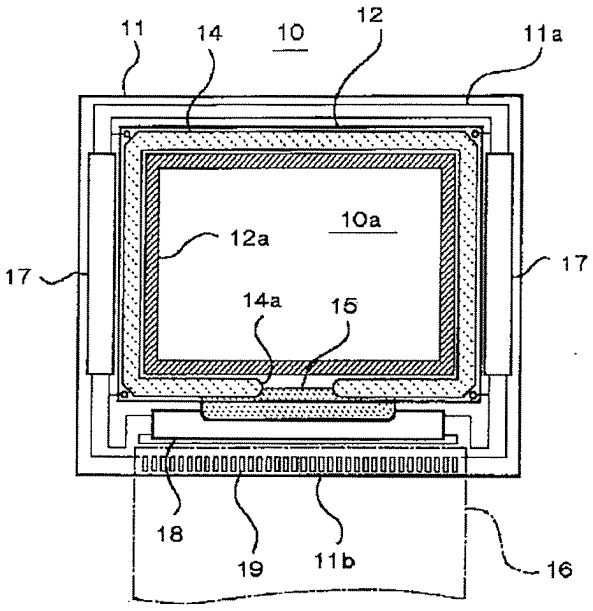
[Drawing 1]



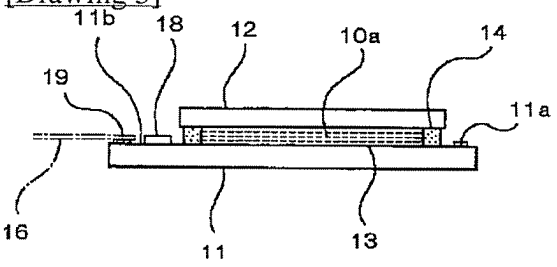
[Drawing 9]



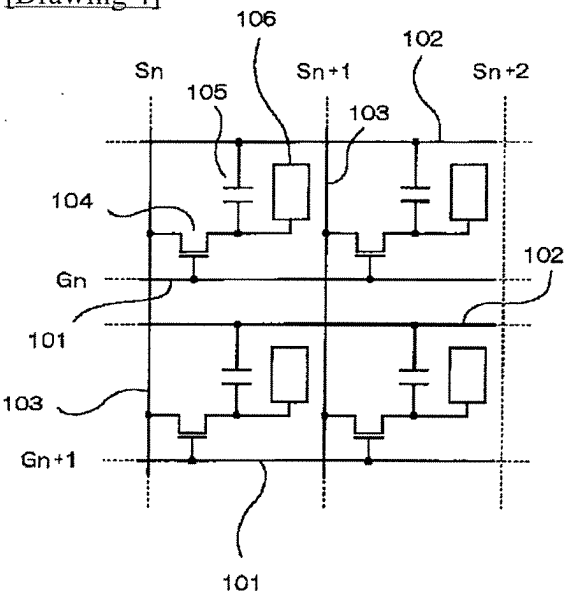
[Drawing 2]



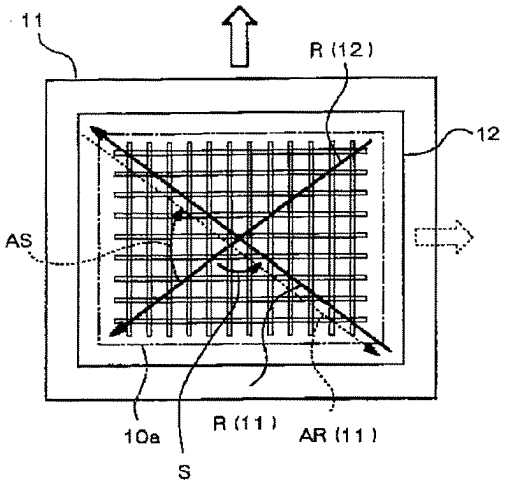
[Drawing 3]



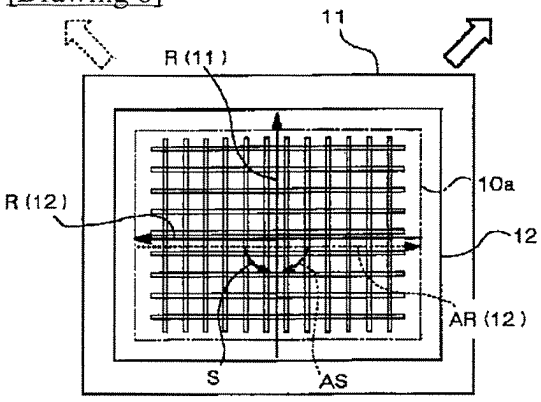
[Drawing 4]



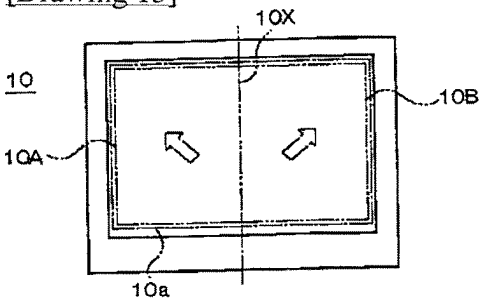
[Drawing 7]



[Drawing 8]



[Drawing 13]



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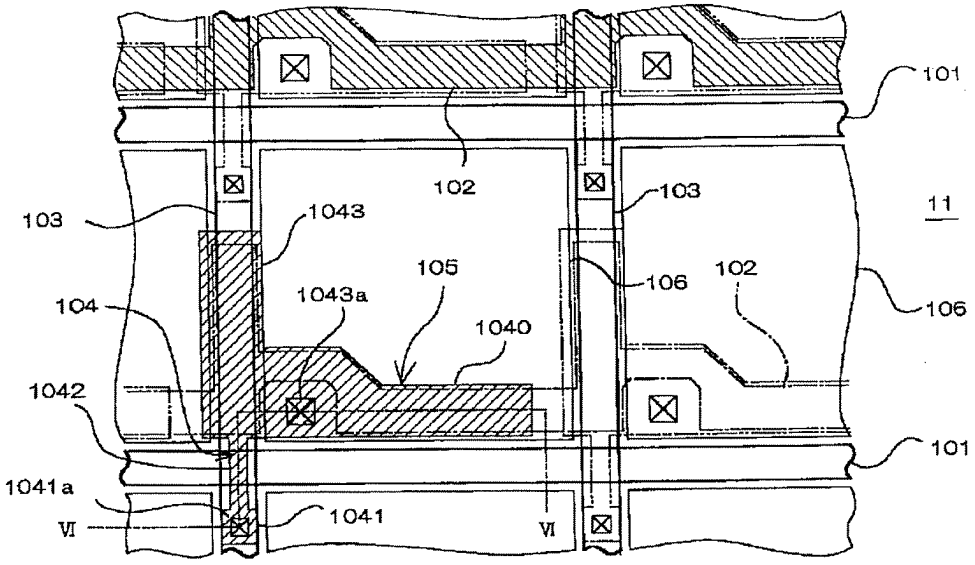

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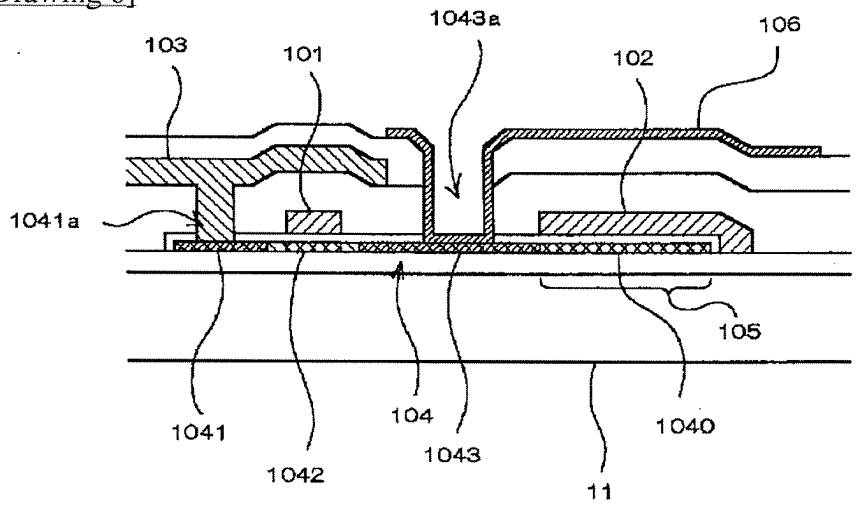

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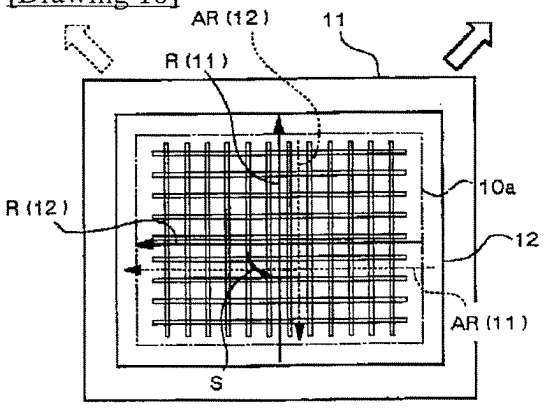

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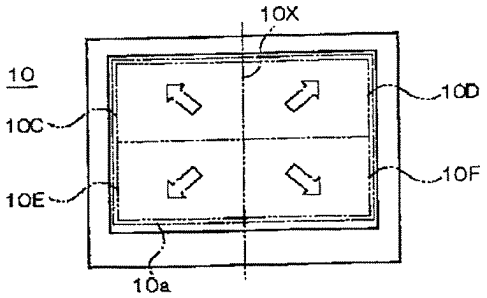

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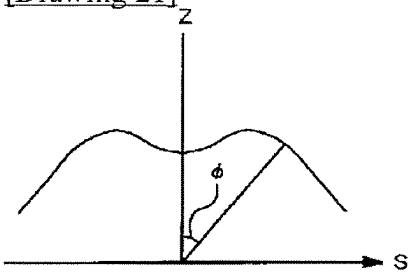

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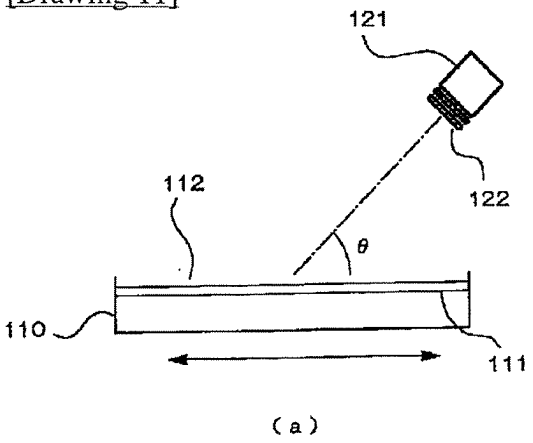
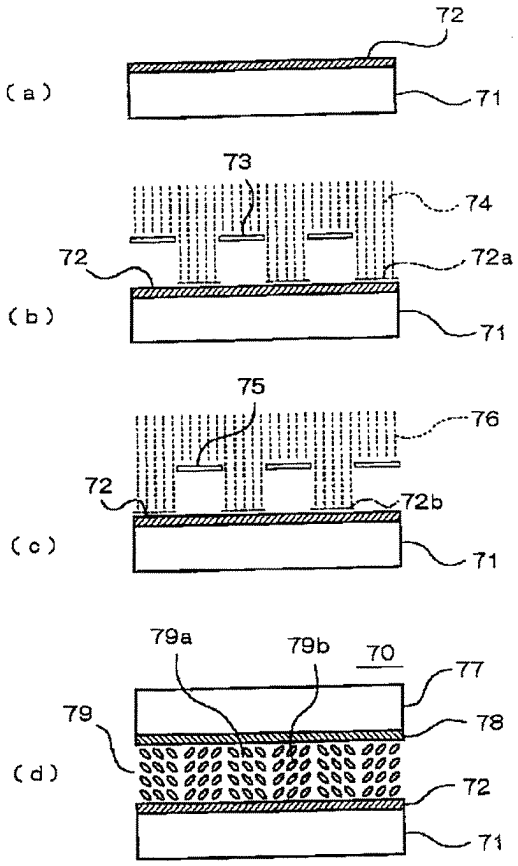
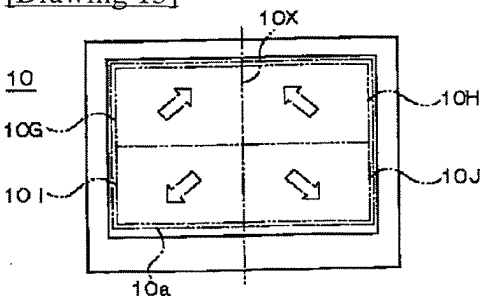


[Drawing 12]



[Drawing 15]



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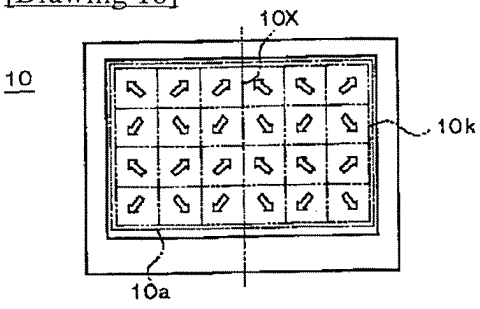
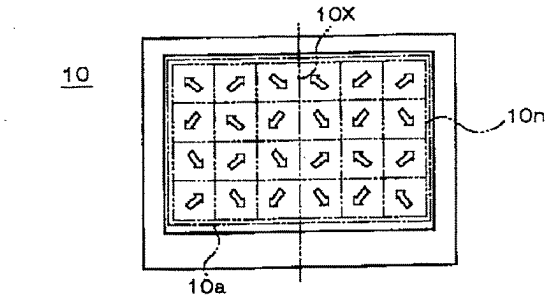
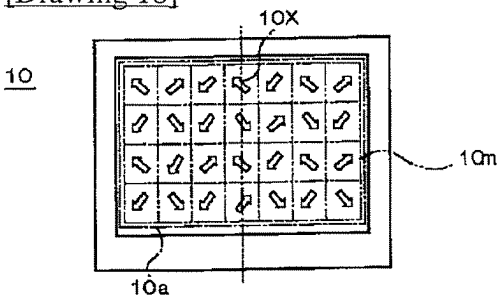


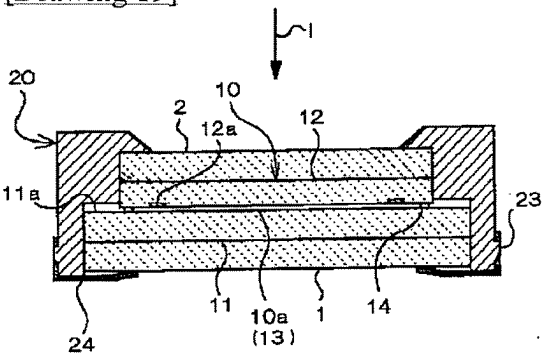
[Drawing 17]



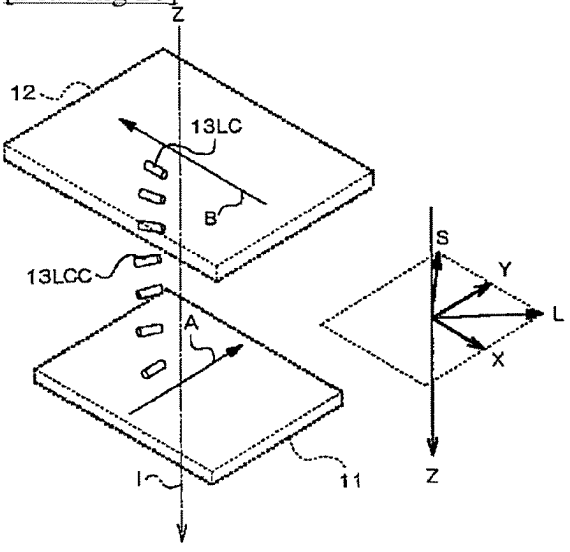
[Drawing 18]



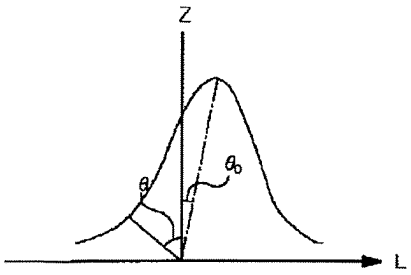
[Drawing 19]



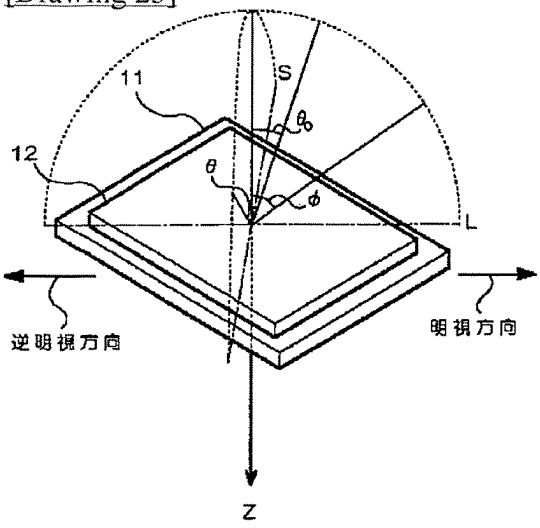
[Drawing 20]



[Drawing 22]



[Drawing 23]



[Translation done.]